Abbreviations and Acronyms

This section contains the abbreviations that pertain to the administrative and technical information within the license renewal application. The abbreviations that pertain to the environmental information are included in the front of Appendix E (Environmental Report).

Abbreviation	Definition
AC	Alternating Current
ACI	American Concrete Institute
ACSR	Aluminum Conductor Steel Reinforced
ADHR	Auxiliary Decay Heat Removal
ADS	Atmospheric Dilution System
AEC	Atomic Energy Commission
AERM	Aging Effect Requiring Management
ALARA	As Low As Reasonably Achievable
AMP	Aging Management Program
AMR	Aging Management Review
ANSI	American National Standards Institute
AOT	Abnormal Operational Transient
AOV	Air Operated Valve
API	American Petroleum Institute
APRM	Average Power Range Monitor
ART	Adjusted Reference Temperature
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	Anticipated Transient Without Scram
B&PV	Boiler and Pressure Vessel
B&W	Babcock and Wilcox
BFN	Browns Ferry Nuclear Plant
BLDG	Building
BP	Business Practice
BPV	Bypass Valve
BTP	Branch Technical Position

Abbreviation	Definition
BWR	Boiling Water Reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Project
CAD	Containment Atmosphere Dilution
CAM	Containment Air Monitoring
CAP	Corrective Action Plan
CAS	Central Alarm Station
CASS	Cast Austenitic Stainless Steel
CC	Criticality Control
CCCW	Closed Cycle Cooling Water
CCRIS	Calculation Cross Reference Information System
CDF	Core Damage Frequency
CE	Conducts Electricity
CF	Chemistry Factor
CFR	Code Of Federal Regulations
CLB	Current Licensing Basis
CMAA	Crane Manufacturers Association of America
CO_2	Carbon Dioxide
COLR	Core Operating Limits Report
CRD	Control Rod Drive
CRDA	Control Rod Drop Accident
CREVS	Control Room Emergency Ventilation System
CS	Core Spray
CSD	Cold Shutdown
CSPE	Chlorosulfonated Polyethylene
CST	Condensate Storage Tank
CUF	Cumulative Usage Factor
DBA	Design Basis Accident
DBE	Design Basis Event
DC	Direct Current
DCD	Design Criteria Document
DG	Diesel Generator

Abbreviation	Definition
DG	Draft Regulatory Guide
DOR	Division of Operating Reactors
DP	Debris Protection
ECCS	Emergency Core Cooling System
ECP	Electrochemical Potential
EDG	Emergency Diesel Generator
EDMS	Electronic Document Management System
EECW	Emergency Equipment Cooling Water
EFPD	Effective Full-Power Day
EFPY	Effective Full-Power Year
EHC	Electro-Hydraulic Control
EMA	Equivalent Margin Analysis
EMPAC	Enterprise Maintenance Planning and Control system
EOL	End of Life
EOP	Emergency Operating Procedure
EPDM	Ethylene Propylene Diene Monomer
EPR	Ethylene Propylene Rubber
EPRI	Electric Power Research Institute
EQ	Environmental Qualification
ES/SEP	Expansion/Separation
ESF	Engineered Safety Feature
FAC	Flow-Accelerated Corrosion
FB	Fire Barrier
FD	Flow Distribution
F_{en}	Environmental Fatigue Life Correction Factor
FERC	Federal Energy Regulatory Commission
FHA	Fire Hazards Analysis
FLB	Flood Barrier
FOS	Fuel Oil Storage
FP	Fire Protection
FPC	Fuel Pool Cooling and Cleanup

Abbreviation	**Definition**
FPR	Fire Protection Report
FR	Federal Register
FR	Flow Restriction
FSAR	Final Safety Analysis Report
FW	Feedwater
GALL	Generic Aging Lessons Learned report
GE	General Electric
GL	Generic Letter
GPM	Gallons per Minute
GSI	Generic Safety Issue
H_2	Hydrogen
HAZ	Heat Affected Zone
HCU	Hydraulic Control Unit
HE/ME	High/Low (Moderate) Energy Line Break
HELB	High-Energy Line Break
HEPA	High Efficiency Particulate Air
HIC	High Integrity Container
HMWPE	High Molecular Weight Polyethylene
HP	High Pressure
HPCI	High Pressure Coolant Injection
HPFP	High Pressure Fire Protection
HSD	Hot Shutdown
HT	Heat Transfer
HVAC	Heating, Ventilation, and Air Conditioning
HWWV	Hardened Wetwell Vent
I&C	Instrumentation and Control
IASCC	Irradiation Assisted Stress Corrosion Cracking
ID	Inside Diameter
IEB	Inspection and Enforcement Bulletin
IEEE	Institute of Electrical and Electronics Engineers
IGA	Intergranular Attack

Abbreviation	Definition
IGSCC	Intergranular Stress Corrosion Cracking
ILRT	Integrated Leak Rate Test
IN	Information Notice
INPO	Institute of Nuclear Power Operations
INS	Insulation – Electrical
IPA	Integrated Plant Assessment
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination of External Events
IPS	Intake Pumping Station
IR	Insulation Resistance
IRM	Intermediate Range Monitor
ISG	Interim Staff Guidance
ISI	Inservice Inspection
IST	Inservice Testing
ITG	Issues Task Group
kV	Kilovolt
LCD	Liquid Crystal Display
LCO	Limiting Condition for Operation
LED	Light Emitting Diode
LER	Licensee Event Report
LLRT	Local Leak Rate Test
LLRW	Low Level Radioactive Waste
LOCA	Loss Of Coolant Accident
LOOP	Loss Of Offsite Power
LP	Low Pressure
LPCI	Low Pressure Coolant Injection
LPRM	Local Power Range Monitor
LR	License Renewal
LRA	License Renewal Application
LRT	Leak Rate Test
LWR	Light Water Reactor

Abbreviation	Definition
MB	Missile Barrier
MC	Mechanical Closure
MCC	Motor Control Center
MEL	Master Equipment List
MELB	Medium-Energy Line Break
MeV	Million electron Volts
MIC	Microbiologically Influenced Corrosion
MOV	Motor Operated Valve
MRC	Management Review Committee
MRV	Minimum Required Value
MS	Main Steam
MSIV	Main Steam Isolation Valve
MSR	Moisture Separator/Reheater
MSRV	Main Steam Safety Relief Valve
MT	Magnetic Particle Testing
MWD/T	Megawatt Days per Ton
n/cm^2	Neutrons per Square Centimeter
NDE	Nondestructive Examination
NDT	Nil-Ductility Temperature
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
NGCC	Natural Gas Combined Cycle
NPS	Nominal Pipe Size
NPSH	Net Positive Suction Head
NRC	Nuclear Regulatory Commission
NRMS	Normalized Root Mean Square
NRR	NRC Office of Nuclear Reactor Regulation
NSAC	Nuclear Safety Analysis Center
NSR	Nonsafety-Related
NSSS	Nuclear Steam Supply System

Abbreviation	Definition
NUMARC	Nuclear Management and Resources Council
NUREG	U. S. Nuclear Regulatory Commission Regulatory Guide
O_2	Oxygen
OCCW	Open-Cycle Cooling Water
OD	Outside Diameter
OE	Operating Experience
OM	Operation and Maintenance
PAM	Post Accident Monitoring
PASS	Post Accident Sampling System
PB	Pressure Boundary
PC	Pulverized Coal
PER	Problem Evaluation Report
PL	Fission Product Plateout
PRA	Probabilistic Risk Assessment
PSIA	Pounds per Square Inch (absolute)
PSIG	Pounds per Square Inch (gage)
PSPMP	Periodic Surveillance and Preventive Maintenance Program
PT	Penetrant Testing
P-T	Pressure – Temperature
PTS	Pressurized Thermal Shock
PUAR	Plant Unique Analysis Report
PVC	Polyvinyl Chloride
PW	Pipe Whip Restraint
PWR	Pressurized Water Reactor
QA	Quality Assurance
QAPM	Quality Assurance Program Manual
RAI	Request for Additional Information
RBCCW	Reactor Building Closed Cooling Water
RCIC	Reactor Core Isolation Cooling
RCPB	Reactor Coolant Pressure Boundary
RCS	Reactor Coolant System

Abbreviation	Definition
RCW	Raw Cooling Water
RG	Regulatory Guide
RHR	Residual Heat Removal
RHRSW	Residual Heat Removal Service Water
RICSIL	Rapid Information Communication Services Information Letter
RPS	Reactor Protection System
RPT	Recirculation Pump Trip
RPV	Reactor Pressure Vessel
RPVII	Reactor Pressure Vessel Internals Inspection
RSW	Raw Service Water
RT	Reference Temperature
RT_{NDT}	Nil-Ductility Reference Temperature
RVLIS	Reactor Vessel Level Instrumentation System
RWCU	Reactor Water Cleanup
SAS	Secondary Alarm Station
SAW	Submerged Arc Weld
SBLOCA	Small Break Loss Of Coolant Accident
SBO	Station Blackout
SCC	Stress Corrosion Cracking
SCW	Source of Cooling Water
SDC	Shutdown Cooling
SEIS	Supplemental Environmental Impact Statement
SER	Safety Evaluation Report
SFC	Spent Fuel Cooling
SFP	Spent Fuel Pool
SGT	Standby Gas Treatment
SH	Radiation Shielding
SIL	Services Information Letter
SLC	Standby Liquid Control
SMP	Structures Monitoring Program
SO_2	Sulfur Dioxide

Abbreviation	**Definition**
SOC	Statement of Consideration
SOER	Significant Operating Experience Report
SP	Shelter/Protection
SPP	Standard Program and Process
SPR	Spray Pattern
SR	Safety-Related
SRM	Source Range Monitor
SRM	Staff Requirements Memo
SRP-LR	Standard Review Plan for License Renewal
SRV	Safety Relief Valve
SS	Stainless Steel
SS	Structural Support
SSA	Safe Shutdown Analysis
SSC	Systems, Structures, and Components
SSDP	Safe Shutdown Program (Appendix R)
SSE	Safe Shutdown Earthquake
TAP	Torus Attached Piping
TGSCC	Trans-Granular Stress Corrosion Cracking
TIP	Traversing In-Core Probe
TLAA	Time-Limited Aging Analysis
TRM	Technical Requirements Manual
TS	Technical Specifications
TVA	Tennessee Valley Authority
TVAN	Tennessee Valley Authority Nuclear
U1	Unit 1
U2	Unit 2
U3	Unit 3
UFSAR	Updated Final Safety Analysis Report
UHS	Ultimate Heat Sink
UNID	Unique Component Identifier
UPS	Uninterruptible Power Supply

Abbreviation	Definition
USAS	USA Standard
USE	Upper-Shelf Energy
USI	Unresolved Safety Issue
UT	Ultrasonic Testing
UV	Ultra Violet
V	Volt
VFD	Variable Frequency Drive (replacing Reactor Recirculation System Motor Generator sets)
VFLD	Vessel Flange Leak Detection
WO	Work Order
WSP	West Side Portal Office Building
XLPE	Cross-Linked Polyethylene

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1.0 ADMINISTRATIVE INFORMATION

Pursuant to Part 54 of Title 10 of the Code of Federal Regulations (10 CFR 54), the Tennessee Valley Authority seeks renewal for an additional 20 year term for the facility operating licenses for:

Browns Ferry Nuclear Plant Unit 1	License DPR-33
Browns Ferry Nuclear Plant Unit 2	License DPR-52
Browns Ferry Nuclear Plant Unit 3	License DPR-68

The application was prepared in accordance with the U.S. Nuclear Regulatory Commission Regulatory Guide 1.188, “Standard Format And Content For Applications To Renew Nuclear Power Plant Operating Licenses,” July 2001, and is consistent with the guidance provided by NEI 95-10, Revision 3, “Industry Guidelines for Implementing the Requirements of 10 CFR 54 -License Renewal”. (NEI 95-10, Revision 4 was transmitted to NRC on October 24, 2003 and is currently awaiting endorsement.)

The License Renewal Application is intended to provide sufficient information for the NRC to complete its technical and environmental reviews, pursuant to 10 CFR Parts 54 and 51, respectively. The License Renewal Application is designed to allow the NRC to make the findings required by 10 CFR 54.29 to support issuing renewed facility operating licenses for Browns Ferry Units 1, 2, and 3. The following is the general information required by 10 CFR 54.17 and 54.19.

1.1 GENERAL INFORMATION

The following is general information is required by 10 CFR 54.17 and 10 CFR 54.19.

1.1.1 Name of Applicant

Tennessee Valley Authority

1.1.2 Address of Applicant

Tennessee Valley Authority
400 West Summit Hill Drive
Knoxville, TN 37902

In addition to the Browns Ferry service list, all communications concerning this application should be copied to:

Gary M. Adkins
Manager, Browns Ferry License Renewal Project
1101 Market Street
Chattanooga, TN 37402-2801
Tennessee Valley Authority
e-mail: gmadkins@tva.gov

1.1.3 Description of Business

Tennessee Valley Authority (TVA) is the nation's largest public power producer. TVA was established by Congress in 1933 primarily to provide navigation, flood control, agricultural and industrial development and to promote the use of electric power in the Tennessee Valley region. TVA, being wholly owned by the United States government, is neither owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. Through 158 public power utilities, TVA supplies electricity to approximately 8.3 million people in the TVA service area.

1.1.4 Organization and Management of Applicant

Listed below are the names and business addresses of the TVA Board of Directors and principal officers, all of whom are citizens of the United States.

Board of Directors:

Glenn L. McCullough, Jr Board of Directors, Chairman	400 West Summit Hill Drive Knoxville, TN 37902
Skila Harris Board of Directors, Director	400 West Summit Hill Drive Knoxville, TN 37902
Bill Baxter Board of Directors, Director	400 West Summit Hill Drive Knoxville, TN 37902

Principal Officers:

Oswald J. "Ike" Zeringue President and Chief Operating Officer	400 West Summit Hill Drive Knoxville, TN 37902
Maureen H. Dunn Executive Vice President and General Counsel	400 West Summit Hill Drive Knoxville, TN 37902
Michael E. Rescoe Executive Vice President and Chief Financial Officer	400 West Summit Hill Drive Knoxville, TN 37902
Mark O. Medford Executive Vice President, Customer Service and Marketing	26 Century Blvd. Nashville, TN 37214
D. LeAnne Stribley Executive Vice President, Administration	400 West Summit Hill Drive Knoxville, TN 37902
John E. Long, Jr. Executive Vice President, Human Resources	400 West Summit Hill Drive Knoxville, TN 37902
Ellen Robinson Executive Vice President, Communications and Government Relations	400 West Summit Hill Drive Knoxville, TN 37902
Theresa A. Flaim Senior Vice President, Strategic Planning and Analysis	400 West Summit Hill Drive Knoxville, TN 37902
John J. Bradley Senior Vice President, Economic Development	26 Century Blvd. Nashville, TN 37214

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

TVA requests renewal of the BFN Units 1 through 3 facility operating licenses for a period of 20 years beyond the expiration date of each of the current licenses:

Unit	License No.	License Class	Current Expiration Date
Unit 1	DPR-33	104(b)	12/20/2013
Unit 2	DPR-52	104(b)	6/28/2014
Unit 3	DPR-68	104(b)	7/02/2016

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

1.1.6 Earliest and Latest Dates for Alterations, If Proposed

TVA does not propose to alter the station in connection with this application. The evaluation of systems, structures and components as required by 10 CFR 54.21 has been completed and is described in the body of the BFN License Renewal Application. This evaluation did not identify the need for refurbishment of structures or components related to license renewal.

In 1985, TVA shut down all three units at BFN to address management and technical issues. With the resolution of the management issues and Unit 2 technical issues, Unit 2 was restarted in 1991. Unit 3 was restarted in 1995. TVA has initiated a restart plan to return Unit 1 to service. The basic TVA principle for the Unit 1 Restart is that all three BFN units will be operationally identical upon completion of Unit 1 restart activities. The modification activities associated with Unit 1 restart are current license term activities and are not considered alterations related to license renewal. Some of these activities may be implemented during or following NRC review of this application. To facilitate NRC review, Unit 1 restart activities with a potential to impact the application are presented in Appendix F.

1.1.7 Listing of Regulatory Agencies Having Jurisdiction and News Publications

Regulatory Agencies

As required by its founding charter, the Tennessee Valley Authority Act of 1933, TVA sets rates for electric power which will produces revenues sufficient to provide funds for operation, maintenance, and administration of its power system. No other regulatory agencies have jurisdiction over TVA's rates and services.

News Publications

The News Courier
410 West Green Street
Athens, AL 35612

1.1.8 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." TVA requests that, as appropriate, conforming changes be made to Article VII of the indemnity agreement, and Item 3 of the Attachment to that agreement, specifying the extension of agreement until the expiration date of the renewed facility operating licenses as sought in this application.

1.1.9 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, TVA, as a part of the application for renewed operating licenses, 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.

1.1.10 Information Incorporated by Reference

There are no documents incorporated by reference as part of the application. Any document references are listed for information only.

1.2 DESCRIPTION OF BROWNS FERRY NUCLEAR PLANT

The Browns Ferry Nuclear Power Plant site is located on the north shore of Wheeler Reservoir in Limestone County, Alabama, at Tennessee River Mile (TRM) 294. The site is approximately 30 miles west of Huntsville, Alabama. It is 10 miles northwest of Decatur, Alabama, and 10 miles southwest of Athens, Alabama.

The plant is located on property owned by the United States and in the custody of TVA. The site is an 840-acre tract just south of U.S. Highway 72 and is directly accessible from County Road 25 (Nuclear Plant Road). County Road 25 intersects U.S. Highway 72 approximately six miles north of the site and it also intersects U.S. Highway 31 approximately nine miles east of the site.

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

This section describes the process for identification of structures and components subject to aging management review in the Browns Ferry Nuclear Plant integrated plant assessment.

The scoping and screening methodology is described in Section **2.1.** The results of the assessment to identify the systems and structures within the scope of license renewal are in Section **2.2**. The results of the identification of structures and components subject to aging management review are in Section **2.3** for mechanical systems, Section **2.4** for structures, and Section **2.5** for electrical and instrumentation and controls (I&C) systems.

Intended Functions Abbreviations and Definitions

Table 2.0.1 provides expanded definitions and abbreviations of structure and component intended functions identified in this application. The tables in the application may refer to the function or the abbreviation.

Table 2.0.1 Intended Functions Abbreviations and Definitions

Function	Abbreviation	Definition
Criticality Control	CC	Prevent criticality of new and spent fuel by spacing or by absorbing neutrons
Conducts Electricity	CE	Conduct electrical current
Debris Protection	DP	Prevent debris from entering a system or component
Expansion/Separation	ES/SEP	Allows for expansion of a component
Fire Barrier	FB	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant
Fission Product Plateout	PL	Retains fission products by plateout on a surface; used for condenser; credited in analyses for MSIV alternate leakage treatment
Flood Barrier	FLB	Provide flood protection barrier for internal and external flooding events
Flow Distribution	FD	Provide for flow distribution in mechanical systems
Flow Restriction	FR	Throttle or restrict flow
High/Moderate Energy Line Break	HE/ME	Provide protection against the effects of a high energy or a low (moderate) energy line break
Heat Transfer	HT	Provide for heat exchange of heat from one system or medium to another
Insulation – Electrical	INS	Prevent the transmission of electrical current

Function	Abbreviation	Definition
Missile Barrier	MB	Provide missile barrier (internally or externally generated)
Mechanical Closure	MC	Mechanical closure (e.g., bolting)
Pressure Boundary	PB	Provide pressure-retaining boundary to direct and contain fluids and gases; Provide an essentially leak tight barrier, including a barrier for fission products; Provide structural integrity of mechanical systems and components; Includes structural overpressure protection for blowout panels; Retains fission products by plateout on a surface (used for components credited in analyses for MSIV alternate leakage treatment).
Pipe Whip Restraint	PW	Restrain the movement of a ruptured pipe
Source of Cooling Water	SCW	Provide a source of cooling water for plant shutdown
Shelter/Protection	SP	Shelter and protect a component from the effects of weather or localized environmental conditions
Radiation Shielding	SH	Reduce radiation dose
Spray Pattern	SPR	Provide a spray pattern
Structural Support	SS	Provide structural and/or functional support for in-scope structures and components; can be annotated as SS(NSR) to indicate the intended function is performed by a NSR component; provide structural integrity of mechanical systems and components

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 Introduction

Browns Ferry Nuclear Plant (BFN) identified those systems, structures, and components within the scope of license renewal regulations pursuant to the three criteria located in 10 CFR 54.4(a). For those systems, structures, and components within the scope of license renewal, BFN then identified the passive, long-lived structures and components that were subject to aging management review (i.e., screening), pursuant to Section 54.21(a). For systems, structures, and components within the scope of license renewal, 10 CFR 54.21(a)(1) requires the license renewal applicant to identify and list the structures and components subject to an AMR. 10 CFR 54.21(a)(2) requires that the methods used to implement the requirements of 10 CFR 54.21(a)(1) be described and justified. As required by 10 CFR 54.21(a)(2), this section of the BFN license renewal application (LRA) provides a description and justification of the methodology used to identify and list BFN structures and components subject to an AMR.

The scoping and screening methodologies used in this application are applied consistently for all three BFN units. The scoping and screening methodology addresses BFN units 1, 2, and 3. 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 types used to perform scoping and screening. Section **2.1.4** describes the scoping methodology. Section **2.1.5** describes the screening methodology. Section **2.1.6** describes the method for documenting license renewal evaluation results. Section **2.1.7** provides a discussion of additional considerations incorporated into the methodology.

During the performance of scoping and screening activities, BFN identified differences between the current licensing basis for Unit 1 and the current licensing bases for Units 2 and 3. Additional details associated with these differences can be located in Appendix **F** to this application. Where current licensing basis differences impact the scoping and screening results, the following approach is employed to present these differences:

1. Permanent licensing basis differences are described in the LRA text if they are expected to remain in effect after the restart of Unit 1 from its current extended outage.
2. If a current licensing basis difference is expected to be resolved prior to the restart of Unit 1 from its current outage, such that the licensing basis for Unit 1 will be consistent with the current licensing bases of Units 2 and 3, the Unit 1 current licensing basis is not described in the text. Rather, the Units 2 and 3 current licensing bases (the Unit 1 restart licensing basis) are described in the application text and are annotated with a bold bordered enclosure. For each annotation, there is a reference to an Appendix F section that explains the difference between the current and expected Unit 1 restart licensing basis and presents the plan and schedule for making the Unit 1 current licensing basis consistent with the Units 2 and 3 current licensing bases.

2.1.2 Application of Scoping Criteria in 10 CFR 54.4(a)

10 CFR 54.4(a)(1)-(3) provide criteria for including systems, structures, and components (SSCs) within the scope of the license renewal rule. These criteria are briefly identified as follows:

10 CFR 54.4(a)(1) – Safety-related

10 CFR 54.4(a)(2) – Nonsafety-Related SCCs Whose Failure Could Prevent Satisfactory Accomplishment of Safety-Related Functions

10 CFR 54.4(a)(3) – The five regulated events

- 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)
- Station Blackout (10 CFR 50.63)

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

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

10 CFR 54.4(a)(1) requires that 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 offsite exposures comparable to the guidelines in 10 CFR 50.34(a)(1), 10 CFR 50.67(b)(2), or 10 CFR 100.11, as applicable[1]

The determination of the SSCs that perform safety-related functions was completed by a review of the documentation sources listed in Section **2.1.3**. If one or more of the three safety-related criteria were met, the function was determined to be a safety-related intended function and the corresponding SSCs were determined to be within the scope of license renewal.

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1 The CLB for BFN Units 1, 2, and 3 is 10 CFR 100.11. A BFN licensing action is being prepared to change the licensing basis to 10 CFR 50.67.

2.1.2.2 10 CFR 54.4(a)(2) – Nonsafety-Related SSCs Whose Failure Could Prevent Satisfactory Accomplishment of Safety-Related Functions

10 CFR 54.4(a)(2) requires the applicant to include nonsafety-related SSCs in the scope of license renewal whose failure could prevent satisfactory accomplishment of any of the functions identified in paragraphs 10 CFR 54.4(a)(1)(i)-(iii).

The identification of SSCs satisfying criterion 10 CFR 54.4(a)(2) was based on review of applicable CLB and engineering design bases and design documents, plant specific and industry operating experience, and industry guidance documents. The 10 CFR 54.4(a)(2) scoping methodology is consistent with the NRC guidance provided in the most current draft of ISG-09, Scoping Criteria 54.4(a)(2).

Functional Failures of Nonsafety-Related SSCs

With exceptions, SSCs required to perform a function in support of safety-related functions are classified as safety-related and included in the scope of license renewal per 10 CFR 54.4(a)(1). For the exceptions where nonsafety-related SSCs are required to remain functional in support of a safety-related function, the supporting SSCs are included in the scope of license renewal per 10 CFR 54.4(a)(2).

Current Nonsafety-Related SSCs that are contained in the CLB

Missiles

SSCs that provide missile barrier protection were determined to be safety-related SSCs and are in scope per 10 CFR 54.4(a)(1) rather than 10 CFR 54.4(a)(2). Section **2.4** identifies structural component types with missile barrier protection intended functions.

Overhead-handling Systems

Overhead-handling systems located in structures that contain safety-related SSCs are in scope per 10 CFR 54.4(a)(2) if they have the ability to drop a load resulting in damage to a structure or component that prevents the satisfactory accomplishment of a safety-related intended function. Overhead-handling systems identified during this search included cranes, monorails, hoists, and mobile A-frames. The Cranes System (Section **2.3.3.34**) presents the scoping and screening results for the over-head handling systems.

Flooding

Using the electrical spaces approach described in Sections **2.1.4.2** and **2.1.5.2**, level instrumentation and alarms used to warn the operators of external flood conditions or internal flooding, where operator action is necessary to mitigate a flood, are in the scope of license renewal. Nonsafety-related SSCs used to mitigate the effects of flooding are in scope per

10 CFR 54.4(a)(2). Walls, dikes, doors, etc. used to mitigate the effects of flooding are in scope for 10 CFR 54.4(a)(1) rather than 10 CFR 54.4(a)(2). Section 2.4 identifies component types, with flood barrier intended functions.

High Energy Line Break (HELB)

Pipe whip restraints and jet impingement shields that are designed and installed to protect safety-related equipment from the effects of a HELB, are within the scope of license renewal per 10 CFR 54.4(a)(1). Along with this mitigative option, BFN also employs the preventive option of including nonsafety-related liquid-filled lines with potential leakage or spray spatial interaction within the scope of license renewal per 10 CFR 54.4(a)(2).

Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs

Liquid-filled nonsafety-related SSCs directly connected to safety-related SSCs are in scope for 10 CFR 54.4(a)(2). Nonsafety-related supports in structures that contain safety-related SSCs are in the scope of license renewal per 10 CFR 54.4(a)(2) if they have the ability to prevent the satisfactory accomplishment of a safety-related intended function. Therefore, the need to identify the first seismic anchor beyond any safety-related/nonsafety-related interface was eliminated.

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

The nonsafety-related SSCs are applicable to the following structures that contain safety-related SSCs.

- Reactor Buildings
- Primary Containment Structures
- Diesel Generator Buildings
- Intake Pumping Station
- Reinforced Concrete Chimney
- Standby Gas Treatment Building
- Vacuum Pipe Building
- Turbine Buildings
- Ventilation Vaults
- Residual Heat Removal Service Water Tunnel
- Electrical Cable Tunnel
- Underground Concrete Encased Structures

Nonsafety-related structural components that could prevent satisfactory accomplishment of a safety-related intended function are included in the scope of license renewal.

Nonsafety-related, liquid-filled piping located in structures that contain safety-related SSCs is in scope per 10 CFR 54.4(a)(2), using the preventive option with the following exceptions: The Intake Pumping Station, Turbine Buildings, Ventilation Vaults, and the Residual Heat Removal Service Water Tunnel contain the only exceptions to this approach. The nonsafety-related liquid filled piping within these four structures were evaluated and determined not to prevent the satisfactory accomplishment of a safety-related intended function

Systems and Components Containing Air/Gas

The nonsafety-related air/gas and heating, ventilation, and air conditioning (HVAC) SSCs are not in the scope of license renewal per 10 CFR 54.4(a)(2) because industry and site specific operating experience reviews confirmed that nonsafety-related air/gas and HVAC SSCs have not adversely impacted the satisfactory accomplishment of a safety-related intended function. Nonsafety-related structural components for air/gas and HVAC systems that could prevent satisfactory accomplishment of a safety-related intended function are in the scope of license renewal per 10 CFR 54.4(a)(2).

2.1.2.3 10 CFR 54.4(a)(3) – The Five 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 NRC'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).

Because BFN reactors are boiling water reactors, 10 CFR 50.61, the regulation for pressurized thermal shock, is not applicable. The regulated event scoping determination methodology is further discussed in Section **2.1.3.4**.

2.1.3 Documentation Sources Used for Scoping and Screening

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

- Updated Final Safety Analysis Report
- Safe Shutdown Analysis Calculation
- Maintenance Rule documentation
- Current Licensing Basis and Design Basis Documents (Design Criteria Documents and Calculations[2])
- Controlled Plant Component Database

2 At TVA, the term calculation refers to qualitative assessments and analyses as well as quantitative computations.

2.1.3.1 Updated Final Safety Analysis Reports

The BFN Updated Final Safety Analysis Report was used as a source of current licensing basis information for each unit.

2.1.3.2 Safe Shutdown Analysis Calculation

The BFN Safe Shutdown Analysis calculation was used as the primary source document to identify safety-related functions for systems. This calculation is a living document that systematically describes how each system is utilized in the documented safety analysis for each applicable event and summarizes the required systems' functions for safe shutdown for transients, accidents, and special events[3]. The Safe Shutdown Analysis calculation documents the system safety actions for which credit has been taken in the UFSAR, Reload Analyses, and other licensing communications concerning transient, accident, and special events.

The Safe Shutdown Analysis calculation was also used to identify system and structure functions that fall into the categories of supporting systems and nonsafety-related systems affecting safety-related systems.

The Safe Shutdown Analysis calculation assumes operation of Units 1, 2, and 3 in any combination of reactor operating states, based on the assumption that the following major modifications will be completed on Unit 1 prior to its restart from its current extended outage:

- Installation of an Analog Trip System similar to that installed on Units 2 and 3
- Revision of the main steam line isolation valve closure reactor water level trip setpoint for Unit 1 to be the same as on Units 2 and 3
- Change of the anticipated transient without scram logic for Unit 1 (high pressure or low water level) trips from the Reactor Recirculation system motor generator set breakers to the recirculation pump motor breakers similar to Units 2 and 3
- Installation of the Post Accident Sampling system in Unit 1 to be similar to the Units 2 and 3 installation
- Removal of the Rod Sequence Control system from Unit 1 so that the Unit 1 Rod Control system is similar to that installed on Units 2 and 3
- Revision and activation of the common accident signal between Units 1 and 2
- Elimination of the Unit 1 main steam line radiation monitor scram function so that the Unit 1 Reactor Protection system is similar to the Unit 2 and Unit 3 systems
- Main steam line ruggedness modifications similar to those installed on Units 2 and 3

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3 Special events include external events and other events of regulatory concern, such as shutdown without control rods.

2.1.3.3 Maintenance Rule Documents

BFN maintenance rule documents were used as sources to confirm the proper classification of systems and structures. The Maintenance Rule documents provide descriptions of the functions for each system and structure and an evaluation of functions that meet the criteria listed in 10 CFR 50.65(b)(1).[4]

The Maintenance Rule documents also identify system and structure functions that may fall into the category of nonsafety-related SSCs whose failure could prevent satisfactory accomplishments of safety-related functions. The criteria related to nonsafety-related SSCs whose failure could prevent satisfactory accomplishments of safety-related functions for license renewal (10 CFR 54.4(a)(2)) and for the Maintenance Rule (10 CFR 50.65(b)(2)(ii)) are similar. (Section **F.12**)

2.1.3.4 Specific Scoping Documents for Regulated Events

BFN maintains various documents that were used in the license renewal project to support scoping evaluations of the regulated events identified in 10 CFR 54.4(a)(3). Each document is further described in the following paragraphs.

Fire Protection

The BFN Fire Protection Report Volume 1 is incorporated by reference into the UFSAR **10.11**. The BFN Fire Protection Report Volume 1 summarizes the results of a detailed review performed on the fire protection program documents demonstrating compliance with the requirements of 10 CFR 50.48 and provides a list of SSCs credited in the fire protection program (Section **F.3**). The controlled plant component database provides a Quality-Related classification for fire protection program components.

The BFN Fire Protection Report was the primary document reviewed in scoping evaluations to identify SSCs that demonstrate compliance with 10 CFR 50.48. In addition, current licensing basis documents (e.g., commitments and responses to Appendix A to BTP APCSB 9.5-1, “Fire Protection For Nuclear Power Plants”) were reviewed to ensure that SSCs required for performance of necessary safe shutdown functions and for minimizing the risk of radioactive releases to the environment during and following fires are included within the scope of 10 CFR 54.

4 The criteria listed in 10 CFR 50.65(b)(1) are identical to the safety-related criteria of 10 CFR 54.4(a)(1).

Environmental Qualification

Detailed qualification information related to environmental qualification components at BFN is maintained in environmental qualification binders. In addition, the BFN component database provides a list of components that are subject to the BFN environmental qualification program (Section **F.4**).

Anticipated Transients Without Scram

Components of the anticipated transients without scram mitigation systems (Section **F.7**), required by 10 CFR 50.62, were identified using a Quality Related classification field in the controlled plant component database and by reviewing UFSAR section **7.19**.

Station Blackout

Calculations have been created for BFN that summarize the results of a detailed review of the SBO CLB documentation. The calculations provide lists of systems with their credited functions and a listing of major components. As a result of the NRC staff guidance (ISG-02), the SBO calculations were augmented with SBO restoration license renewal drawings that identify the additional components in the off-site power restoration flow paths from the 500 kV and the 161 kV switchyards to the plant safety-related shutdown buses. These drawings were developed using plant procedures for the restoration of off-site power.

2.1.3.5 Controlled Plant Component Database

BFN maintains a controlled plant component database containing integrated design and maintenance record management information. The plant component database lists plant components at the level of detail for which discrete maintenance or modification activities are typically performed.

2.1.3.6 Current Licensing Basis and Design Basis Documents

A variety of current licensing basis and design basis document types were reviewed, when necessary, to determine or confirm SSC intended functions. These documents include:

- Safety evaluation reports that reflect the NRC Staff understanding of SSC functional requirements, performance characteristics, and related regulatory commitments.
- Technical Specifications that provide safety limits, limiting conditions for operation, and surveillance requirements applicable to SSCs whose functions are critical to safety.
- Technical Specification Bases that provide the SSC functional characteristics that underlie the Technical Specification limits and requirements.

- Other documents (such as the Technical Requirements Manual) that provide limits and limiting conditions for operations for SSCs whose functions are important to safety.
- Licensing correspondence that contain BFN regulatory commitments or relief requests related to various SSCs and programs and that contain TVA's understanding of the SSCs' functional requirements and performance characteristics.
- Engineering drawings and documents that provide configuration details.
- Engineering Design Criteria Documents[5] and calculations that provide detailed information about the requirements and characteristics of most systems that perform a safety function.

2.1.4 Scoping Methodology

The following sections describe the methodology used for scoping of BFN Units 1, 2, and 3. Separate discussions of mechanical system scoping methodology, electrical and instrumentation and control system scoping methodology, and structure scoping methodology are provided. Written instructions appropriate for the scoping process were used.

The list of systems and structures evaluated for license renewal scoping was created from lists contained in the plant controlled database, site drawings, and the structures' Design Criteria Document. This list of systems and structures was also reviewed against the BFN UFSAR, Maintenance Rule documents, and other plant design documents. Listings of systems and structures evaluated are provided in Section **2.2**.

BFN did not "realign" system components. However in some cases, all in-scope components of a system were evaluated separately in commodity groups and the system was identified as not within the scope of license renewal. For example, electrical and I&C isolation components in nonsafety-related systems separating the nonsafety-related system from a safety-related system, were included in-scope as electrical commodities, evaluated by the spaces approach, but the nonsafety-related system was not included in-scope. This approach is consistent with the NRC guidance in NUREG 1800 Section 2.2.3.1. The application of this guidance is reflected on Table **2.2.1**.

5 Design Criteria Documents may address a topic. Design Criteria Documents are designated as Design Input documents and tabulate design basis information for systems and topics (e.g., Fire Protection Safe Shutdown Capability and Power, Control and Signal Cables for Use in Class 1 Structures) and specific requirements for components.

2.1.4.1 Mechanical System Scoping Methodology Overview

The BFN reactors are boiling water reactors, classified as General Electric BWR-4 designs with Mark I primary containments. The list of scoping results for mechanical systems is provided in Table **2.2.1**.

For every mechanical system, the following scoping process was applied:

- Identifying System Intended Functions
- Determining the System Evaluation Boundary
- Creation of License Renewal Drawings
- Component Level Scoping

2.1.4.1.1 Identifying System Intended Functions

System intended functions were identified using information obtained from the Safe Shutdown Analysis calculation, the UFSAR, and other applicable documents.

If a safety-related function performed by an evaluated system was identified, the system was included in-scope as satisfying criterion 10 CFR 54.4(a)(1). Functions performed by nonsafety-related systems that are required to ensure satisfactorily accomplishment of a safety-related function were identified and the system was included in-scope as satisfying criterion 10 CFR 54.4(a)(2). Similarly, if functions that were credited in one of the regulated events were identified, the system was included in-scope as satisfying criterion 10 CFR 54.4(a)(3). A function may have been classified as an intended function under more than one of the three criteria in 10 CFR 54.4.

A summary was prepared for each system that listed the identified system intended functions and the 10 CFR 54.4 criteria that caused the system to be in-scope.

Those systems for which no functions were identified as satisfying any of the three scoping criteria were classified as systems outside the scope of 10 CFR 54. For systems classified as outside the scope of 10 CFR 54, no further evaluation was performed.

2.1.4.1.2 Determination of the System Evaluation Boundary

After the system intended functions were identified, the system evaluation boundary was determined. The System Evaluation Boundary identifies the portions of the system that are required for it to perform its intended function. Included in the evaluation boundary are the passive, long-lived components needed for the system to perform its intended functions. The components within the system evaluation boundary were reviewed and scoped against criteria of 10 CFR 54.4(a) during evaluation of the system.

2.1.4.1.3 Creation of License Renewal Drawings

License renewal drawings were created for most mechanical systems determined to be in-scope for license renewal. The license renewal drawings were created in conjunction with the component level scoping. The drawings were created by marking-up the plant drawings associated with the mechanical system being evaluated. The portions of the systems containing passive, long-lived in-scope components are designated on the license renewal drawings by highlighting them with color. The portions of the systems containing components not subject to an aging management review are shown in black. The portions of the systems containing passive, long lived nonsafety-related components included in-scope solely because they satisfy the 10 CFR 54.4(a)(2) criterion are shown on the license renewal drawings in blue. The portions of the systems containing all other passive, long-lived in-scope components are shown in red on the license renewal drawings.

2.1.4.1.4 Component Level Scoping

LR boundary drawings were reviewed in conjunction with physical drawings and component listings from the plant controlled component database to determine the in-scope components. A component was determined to be in-scope if it was needed to fulfill any system intended function or determined to be a nonsafety-related component that could prevent satisfactory accomplishment of any safety-related function. Components were evaluated either individually or in groups of like components and functions to ensure that all components were properly addressed.

Electrical and I&C components of in-scope mechanical systems were classified and evaluated as electrical and I&C commodities. Structural components of in-scope mechanical systems were classified and evaluated as structural commodities.

2.1.4.2 Electrical and Instrumentation and Control System Scoping Methodology

A list of electrical and I&C systems was developed as described in Section **2.1.4**. These electrical and I&C systems were scoped against the criteria of 10 CFR 54.4(a)(1)-(3). The list of electrical and I&C systems and the results of the scoping are provided in Table **2.2.1**.

Electrical and I&C systems include commodity-type components, such as cables and connectors. Industry documents, such as NEI 95-10, provide an inclusive list of typical electrical components found in nuclear power plants. These inclusive lists were reviewed, along with BFN documents (such as plant drawings, plant controlled databases, and purchasing, engineering and vendor documents), to determine the complete set of electrical commodities installed at BFN. These electrical commodities were included in the license renewal scope for evaluation using a “spaces” approach, even if they were in systems that were determined to be not in-scope. An exception to the “spaces” approach is the SBO off-site power restoration methodology described in Section **2.1.8.2**.

2.1.4.2.1 Identifying System Intended Functions

At the system level, the scoping methodology utilized for electrical and I&C systems was identical to the mechanical system-level scoping described in Section **2.1.4.1**. The Safe Shutdown Analysis calculation, UFSAR descriptions, Maintenance Rule documents, CLB, and design basis documents were reviewed to determine the system safety classification and to identify the system intended functions. System level functions were evaluated against the criteria of 10 CFR 54.4(a)(1)-(3). The supporting systems needed to ensure the in-scope system intended functions were identified and evaluated against the criteria in 10 CFR 54.4(a)(2).

2.1.4.2.2 System Evaluation Boundary

Some electrical and I&C systems include mechanical components that support the intended function of in-scope electrical and I&C systems. For example, the Traversing In-core Probe system penetrates the Primary Containment structure and includes safety-related mechanical isolation valves and associated tubing that support the intended functions of the primary containment. For these systems, a mechanical evaluation boundary was established that encompasses the mechanical components of the electrical and I&C system.

Because electrical components whether in mechanical systems or electrical and I&C systems, were included in-scope, electrical and I&C license renewal drawings were not created for electrical and I&C systems, or for the electrical and I&C portions of mechanical systems. An exception to this is that license renewal drawings showing the basic electrical distribution paths for SBO off-site power restoration were developed. Operating procedures were used to develop these SBO off-site power restoration license renewal drawings and to identify required components.

2.1.4.2.3 Component Level Scoping

With the exception of components in the SBO off-site power restoration flow path (Section **2.1.8.2**), plant electrical and I&C components were evaluated using a “spaces” approach. The “spaces” approach for electrical and I&C components is an approach to scoping, screening, and aging management review that performs evaluations of passive, long-lived electrical and I&C components.

The “spaces” approach identifies the electrical and I&C commodity groups that are installed in the plant and the limiting environmental conditions for each group. The “spaces” approach then determines if any area environment is more severe than the limiting environment for the commodity group. If the area environment is more severe than a commodity group’s limit, and if a component in the commodity group is actually located in the area, an aging management review is required for the commodity group.

Structural components (e.g., cable trays) associated with electrical and I&C systems were classified and evaluated as civil commodities. Pressure boundary components of electrical penetrations were also classified and evaluated as civil commodities.

2.1.4.3 Structure Scoping Methodology

Structures, as discussed in this section, include free-standing buildings and structures, the primary containment shell, tank foundations, manholes, tunnels, duct banks, and earthen structures. These structures are listed in Table 2.2.2. The list of structures used for scoping was developed through review of design drawings, the Design Criteria Document for structures, and Maintenance Rule documentation. The Design Criteria Document for structures and the UFSAR were relied upon to identify the safety classification of structures and structural components.

Individual structures are not listed in the controlled plant component database at BFN. Unlike mechanical and electrical systems, structures at BFN stations are not assigned unique identifiers. Unique license renewal identifiers were assigned to each structure for the license renewal evaluations. Generic license renewal identifiers were assigned based on the unit, system, and component type.

2.1.4.3.1 Identifying Structure Intended Functions and Evaluation Boundaries

The plant-level scoping methodology utilized for structures was identical to the plant-level scoping described in Section 2.1.4.1 for mechanical systems. Seismic Class I structures and structural components were considered safety-related. Structure functions were evaluated against the criteria of 10 CFR 54.4(a)(1), (2) and (3) and structure intended functions were identified. Structure evaluation boundaries were determined, including examination of structure interfaces. In those instances where the structure intended functions required support from other structures or systems, or when a failure of a structure could prevent satisfactory accomplishment of any safety-related intended function the supporting or adversely impacting structures were identified and included in-scope.

2.1.4.3.2 Structural Boundary Drawings

Individual license renewal drawings were not created for each structure. However, a single license renewal drawing, based on site plot plan drawings, was created that displays the structures in relation to one another. In-scope structures are identified in Table 2.2.2 and on the license renewal drawing.

2.1.4.3.3 Structural Component Scoping

For structures determined to be within the scope of 10 CFR 54, detailed structural drawings were reviewed to identify structural components (such as structural steel, foundations, floors, walls, ceilings, penetrations or stairways). For in-scope structures, all structural components that are required to support the intended functions of the structure were identified as in-scope of 10 CFR 54. These structural components were generally evaluated as generic structural commodities, not as individual components.

2.1.5 Screening Methodology

Screening is the process of identifying the structures and components that are subject to an aging management review. This section describes the process used to perform screening for the BFN license renewal application. Written instructions appropriate for the screening process were used.

10 CFR 54.21 requires that the structures and components subject to an AMR encompass those structures and components within the scope of the license renewal rule:

(i) That perform an intended function, as described in 10 CFR 54.4, without moving parts or without a change in configuration or properties; and

(ii) That are not subject to replacement based on a qualified life or specified time period.

NEI-95-10, Revision 3, Appendix B, "Typical Structure, Component and Commodity Groupings and Active/Passive Determinations for the Integrated Plant Assessment," provides industry guidance for screening structures and components against criterion of 10 CFR54.21(a)(1)(i). The guidance provided in NEI-95-10, Appendix B, has been incorporated into the BFN license renewal screening process. The list of component passive intended functions utilized in the screening of mechanical system components can be found in Table **2.0.1**, Intended Functions Abbreviations and Definitions.

Components are then determined to be long-lived or short-lived. Components are considered long-lived unless specific plant documentation indicates the component is replaced at intervals of less than forty years.

2.1.5.1 Mechanical System Component Screening Methodology

For mechanical systems, component screening was a continuation of the component scoping activity.

Each in-scope component was evaluated to determine its passive functions. If a component has a passive function that supports a system intended function, and if the component was determined to be long-lived, then the component was made subject to an AMR. Determinations of whether a component is long or short-lived were based on a review of maintenance procedures, records, and vendor recommendations.

2.1.5.2 Electrical and Instrumentation and Control System Component Screening Methodology

Based on the spaces approach to aging management review for electrical components, all electrical and I&C components are in-scope.

Components were grouped into commodities and were determined to be “active” or “passive” based on the guidance in NEI-95-10, Appendix B. For the passive groups, passive intended functions were identified. Additional determinations based on industry and BFN experience identified the long-lived commodity groups. Limiting environmental parameters were identified for each passive, long-lived commodity group.

In parallel, the normal environmental conditions for each plant area were identified. Plant area environments were established for the outside ambient area and for internal compartments of in-scope structures. The limiting plant area environmental conditions were compared to the limiting environmental parameters for each passive, long-lived commodity group. If the plant area conditions exceeded the parameters for a commodity group, a further evaluation was made to determine if a component in the commodity group existed in the area. If a component in the commodity existed in an area where the area conditions exceeded the commodity group’s limiting environmental parameters, a further evaluation could be performed to determine if the component was required for an in-scope system’s intended function. The commodity group required an AMR if there existed any component in any area where the area’s environmental conditions exceeded any of the commodity group’s limiting environmental parameters.

Electrical and I&C components in mechanical systems were screened collectively using the spaces approach, along with similar components from electrical and I&C systems. This approach also applied to any electrical and I&C components associated with structures. In-scope components with mechanical or structural intended functions in electrical and I&C systems were screened in the mechanical or structural screening processes, respectively.

2.1.5.3 Structural Component Screening Methodology

Structures and structural components typically perform their functions without moving parts and without a change in configuration or properties. When a structure or structural component was determined to be in-scope, the structural screening methodology classified the component as passive. This is consistent with guidance found in NEI-95-10 Appendix B. During the structural screening process, the intended functions of structural components were determined. Also, in the structure screening process, an evaluation was made to determine whether in-scope structural components were subject to replacement, based on a qualified time period. For example, an elastomer seal may have been determined to be replaced on a specified time period. If such a determination was made for an in-scope structural component, the component was identified as short-lived and was excluded from an AMR. All structures and structural components that are in-scope are subject to an AMR.

The structural screening included the structural component types in electrical systems (e.g., cable trays) and mechanical systems (e.g., pipe supports).

2.1.6 Documenting Scoping, Screening, and Aging Management Review Results

Supporting information for the scoping, screening and AMR results are maintained as long-term records.

2.1.7 Additional Considerations Incorporated into the Methodology

This section describes additional considerations incorporated into the BFN scoping and screening methodology.

2.1.7.1 General Exclusions

Certain structures and equipment were excluded because they do not meet criteria 10 CFR 54.4(a)(1), (2), or (3). Examples of excluded structures and equipment include: driveways and parking lots, temporary equipment, health physics equipment, portable measuring and testing equipment, tools, spare parts, and motor vehicles. None of the items excluded were credited for use in the CLB or are needed to support plant response to any of the regulated events.

Structures and equipment used solely for emergency preparedness and security were excluded from the scope of license renewal.

2.1.7.2 Treatment of Piping and Equipment Insulation During Scoping and Screening

Insulation at BFN does not have an intended function within the scope of 10 CFR 54.4(a)(1) - (3).

2.1.7.3 Treatment of External Environments During Aging Management Review for Mechanical Components

Component external surfaces were evaluated using a commodity group approach where all components from various station systems constructed of a like material in a like external environment were evaluated as a commodity group. The like aging effects were determined and evaluated, and appropriate aging management activities identified. Bolting was evaluated using this approach.

2.1.7.4 Complex Assemblies

No in-scope SSCs were evaluated as complex assemblies. Passive support subsystem components (e.g., cooling water piping, instrument lines and valves) of complex active components (e.g., the emergency diesel generators) are shown on the LR Drawings for that system. Passive support subsystem components of complex active components were generally scoped and screened separately from the active component.

2.1.7.5 Hypothetical Failures and Cascading

The BFN scoping methodology has required a review of applicable UFSAR sections and other CLB and design basis documents to identify the current licensing basis and design functions of each system or structure being evaluated. This review included only hypothetical failures described in the current licensing basis. The hypothetical failures for the system or structure being evaluated were reviewed to determine if other SSCs were affected by the hypothetical failure.

During the system and structure scoping process, systems or structures that provide support to the primary event mitigating system and structures were identified using the Safe Shutdown Analysis calculation. For safety-related intended functions, this process identified support systems down to a level necessary to provide for the satisfactory accomplishment of the safety-related functions identified in 10 CFR 54.4(a)(1). At BFN, these support systems are in-scope.

2.1.7.6 Multiple Functions

The potential for multiple passive intended functions was considered in identifying the intended functions of structures and components. For example, for in-scope heat exchangers, both the pressure boundary and the heat transfer functions were considered.

2.1.7.7 Electrical Isolation Devices in Out-of-Scope Systems

NUREG-1800 section 2.2.3.1 states, "The applicant may choose to group similar components and structures together in commodity groups for separate analyses. If only a portion of a system or structure has an intended function and is addressed separately in a specific commodity group, it is acceptable for an applicant to identify that system or structure as not being within the scope of license renewal. However, for completeness, the applicant should include some reference indicating that the portion of the system or structure with an intended function that is evaluated with the commodity group."

Electrical isolation devices are evaluated as commodities using the spaces approach (Section **2.5.1**). The nonsafety-related systems that contain electrical isolation devices that have an intended function to provide electrical isolation between a safety-related system and a nonsafety-related system are identified on Table **2.2.1**.

2.1.7.8 Walkdowns

Since liquid filled nonsafety-related piping[6] within safety-related structures was included within the scope of 10 CFR 54.4(a)(2) as a preventive measure, even if mitigating features are installed, walkdowns of safety-related structures were not generally performed.

2.1.7.9 Evaluation of Consumables

The evaluation process for consumables is consistent with the guidance provided in NUREG-1800 Table 2.1-3. Consumables have been divided into the following four categories for the purpose of license renewal: (a) packing, gaskets, component seals, and O-rings; (b) structural sealants; (c) oil, grease, and component filters; and (d) system filters, fire extinguishers, fire hoses, and air packs.

- Group (a) subcomponents (packing, gaskets, seals, and O-rings): Based on ANSI B31.1 and the ASME B&PV Code Section III, the subcomponents of pressure retaining components as shown above are not pressure-retaining parts. Therefore, these subcomponents are not relied on to form a pressure-retaining function and are not subject to an AMR.
- Group (b) structural sealants: AMRs were required for structural sealants in in-scope structures. A summary of the AMR results is presented in Section **2.4**.
- Group (c) subcomponents (oil, grease, and component filters): These components are short lived and are periodically replaced. Various plant procedures are used in the replacement of oil, grease, and filters in components that are in-scope for Licensing Renewal.

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6 Piping completely enclosed within a panel with no SR equipment (e.g., VFD cooling lines) is not considered in-scope.

- Group (d) consumables (system filters, fire extinguishers, fire hoses, and air packs): System Ventilation filters are replaced in accordance with plant procedures based on vendor manufacturers' requirements and system testing. Fire extinguishers are inspected annually and replaced on condition in accordance with plant procedures. Fire hoses are inspected and replaced on condition in accordance with plant procedures based on NFPA 1962, "Standards for the Care, Use, and Service Testing of Fire Hose." Air packs are inspected and replaced on condition and inspected in accordance with plant procedures.

2.1.8 Interim Staff Guidance Summary

This section presents a summary of the BFN response to the following Interim Staff Guidance.

ISG No.	ISG Title	Paragraph No.
ISG-01	Position of GALL Report Presenting One Acceptable Way to Manage Aging Effects for License Renewal	2.1.8.1
ISG-02	Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout (SBO) Rule (10 CFR Part 50.63) for License Renewal (10 CFR 54.4(a)(3))	2.1.8.2
ISG-03	Chapters II and III of GALL Report on Aging Management of Concrete Elements	2.1.8.3
ISG-04	Aging Management of Fire Protection Systems for License Renewal	2.1.8.4
ISG-05	Identification and Treatment of Electrical Fuse Holders for License Renewal	2.1.8.5
ISG-06	Identification and Treatment of Housing for Active Components	2.1.8.6
ISG-07	Scoping Guidance for Fire Protection (FP) Systems, Structures, and Components	2.1.8.7
ISG-08	Updating the Improved Guidance Documents - ISG to Establish the ISG Appeals Process	2.1.8.8
ISG-09	Scoping Criteria 54.4(a)(2)	2.1.8.9
ISG-10	Class of 2003 Standard License Renewal Format	2.1.8.10
ISG-11	Aging Management of Environmental Fatigue for Carbon/Low-Alloy Steel	2.1.8.11
ISG-12	Operating Experience with Cracking of Class 1 Small-Bore Piping	2.1.8.12
ISG-13	Management of Loss of Preload on Reactor Vessel Internals Bolting Using the Loose Parts Monitoring System	2.1.8.13
ISG-14	Operating Experience with Cracking in Bolting	2.1.8.14
ISG-15	ISG for AMP XI.E2 For Non-Environmental Qualification Cables Used in Instrumentation Circuits	2.1.8.15
ISG-16	Time-Limited Aging Analyses (TLAAs) Supporting Information For License Renewal Applications	2.1.8.16

2.1.8.1 ISG-01, Position of GALL Report Presenting One Acceptable Way to Manage Aging Effects for License Renewal

The following presents the NRC staff's position and the BFN response for this final ISG.

Staff Position

"The GALL report already states that it contains one acceptable way to manage aging effects. Therefore, no changes are needed in the GALL report. However, the SRP-LR should be clarified ... to explicitly indicate that the GALL report presents one acceptable way to manage aging effects for license renewal, ... to capture the thought that additional NRC staff evaluation will be required if a method other than the GALL report is relied on in the application for license renewal."

BFN Response

In this application, statements of consistency with NUREG-1801 are made for evaluations. Justifications are provided when an evaluation is not addressed in NUREG-1801 or is not consistent with the NUREG-1801 evaluation.

2.1.8.2 ISG-02, Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout Rule (10 CFR Part 50.63) for License Renewal (10 CFR 54.4(a)(3))

The following presents the NRC staff's position and the BFN response for this final ISG.

Staff Position

The NRC staff guidance states that the plant system portion of the off-site power system should be included within the scope of license renewal and describes this as plant "off-site power system … structures and components within the switchyard and down to the safety-related buses."

BFN Response

The BFN SBO calculations do not include all of the SSCs required to restore an off-site power supply to the plant. However, the NRC interim staff guidance on scoping of equipment relied upon to meet the requirements of the SBO Rule (10 CFR 50.63) for license renewal was incorporated into the BFN scoping methodology. As a result of the NRC staff guidance, the SBO calculations were reviewed along with BFN Emergency Operating Procedures and Technical Specification Bases 3.8.1 to determine the appropriate nonsafety-related portions of the in-plant electrical system that would be used to connect the off-site power system to the safety-related portions of the plant electrical system. Based on this review, SBO off-site power restoration license renewal drawings were developed to identify the components in the off-site power restoration flow paths from the first active component in the 500 kV and the 161 kV switchyards to the plant safety-related shutdown buses.

The unit Class 1E AC Electrical Power Distribution System AC sources consist of the off-site power sources (preferred normal and alternate power sources), and the onsite standby power sources (emergency diesel generators). The Class 1E AC distribution system is divided into redundant divisions, so loss of any one division does not prevent the minimum safety functions from being performed. Each of four 4kV shutdown boards has two off-site power supplies available and a single emergency diesel generator. An off-site circuit consists of breakers, transformers, switches, interrupting devices, bus, cabling, protective relaying, and controls required to transmit power from the off-site transmission network to the 4kV shutdown boards. Off-site power is supplied to the 161kV and 500 kV switchyards from the transmission network by seven transmission lines (two 161 kV lines and five 500 kV lines).

The following nonsafety-related electrical systems are in the scope of 10 CFR 54 because they contain components that meet the criteria of 10 CFR 54.4(a)(3) for Station Blackout off-site power restoration:

- System 202 - 4-kV Unit Boards
- System 204 - 4-kV Unit Start Board & Bus
- System 210 - 4kV Bus Tie Board
- System 236 - Main Transformers
- System 241 - 161-kV Switchyard
- System 242 - Main Generator
- System 243 - Unit Station Service Transformer
- System 245 – Common Station Service Transformer
- System 282 - 250-V DC Distribution Boards
- 500 kV Switchyard

The portions of the nonsafety-related plant electrical systems required for SBO that contain components subject to an AMR extend:

1. From the first active component in the 500 kV switchyard, through main transformer 1 and unit station service transformer 1A or 1B to a 4kV unit board. That unit board feeds 4kV shutdown bus 1 or 2, which then feeds the Unit 1 and 2 4kV shutdown boards and 4kV bus tie board, which feeds Unit 3 4kV shutdown boards.
2. From the first active component in the 500 kV switchyard, through main transformer 2 and unit station service transformer 2A or 2B to a 4kV unit board. That unit board feeds 4kV shutdown bus 1 or 2, which then feeds the Unit 1 and 2 4kV shutdown boards and 4kV bus tie board, which feeds Unit 3 4kV shutdown boards.
3. From the first active component in the Trinity or Athens 161 kV transmission system, through common station service transformer A or B to start bus 1A or 1B via the 4kV unit start board, then to a 4kV unit board. That unit board feeds 4kV shutdown bus 1

or 2, which then feeds the Unit 1 and 2 4kV shutdown boards and also feeds the Unit 3 4kV shutdown boards via the 4kV bus tie board.

4. From the first active component in the 500 kV switchyard, through main transformer 3 and unit station service transformer 3A or 3B to 4kV unit board(s) 3A, 3B, and/or 3C. Each unit board feeds two of the Unit 3 4kV shutdown boards.
5. In the 250 VDC system, the control room DC board that powers switchyard circuit breaker control circuitry.

For a listing of electrical commodities required to restore off-site power following an SBO event and associated license renewal drawings see Section **2.5.1**.

2.1.8.3 ISG-03, Chapters II and III of GALL Report on Aging Management of Concrete Elements

The following presents the NRC staff's positions and the BFN responses for this final ISG.

Staff Position

"Under the Aging Management Program (AMP) column for concrete elements in the containment and Class 1 structures in Chapter II of the GALL report, the staff replaced the current AMP with a new AMP that addresses accessible and inaccessible areas separately based on: (1) the inspection for accessible areas would be required to be performed in accordance with ASME section XI, Subsection IWL under the requirements of 10 CFR 50.55a (existing mandated program) and (2) a plant-specific aging management program is required for inaccessible areas if the below grade environment is found to be aggressive or exposed to flowing water. Therefore, with the existing mandated program, the plant- specific AMP for concrete elements in the containment and Class 1 structures is only required to address inaccessible areas. For Chapter III, the staff again replaced the current AMP with a new AMP that addresses accessible and inaccessible areas separately. The inspection for accessible areas would be required in accordance with a Structural Monitoring Program based on the requirement of 10 CFR 50.65 (Maintenance Rule), while a similar plant-specific program would be required for inaccessible areas by closely following the Chapter II example."

NUREG-1801 Volume III A1.1-a ISG AMP Description

"To address loss of material due to freeze/thaw in inaccessible areas, an evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index>100 day-inch/yr) (NUREG-1557). Documented evidence to confirm that the in-place concrete had the air content between 3% to 6% and the subsequent inspections performed did not exhibit degradations related to freeze-thaw should be considered a part of the evaluation."

BFN Response

For loss of material and cracking due to freeze-thaw of concrete for inaccessible areas, no aging management is required. See discussion of Further Evaluation in **3.5.2.2.2.1**.

NUREG-1801 Volume 2 III A1.1-b ISG AMP Description

"To address an increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in inaccessible areas, a plant-specific aging management program is required for below-grade inaccessible areas (basemat and concrete wall) if the concrete is exposed to flowing water (NUREG- 1557). An aging management program is not required, even if reinforced concrete is exposed to flowing water, if there is documented evidence that confirms the in-place concrete was constructed in accordance with the recommendations in ACI 201.2R-77."

BFN Response

For increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide in inaccessible areas, no aging management is required. See discussion of Further Evaluation in **3.5.2.2.2.1**.

NUREG-1801 Volume 2 III A1.1-c ISG AMP Description

"To address an expansion and cracking due to reaction with aggregates, an evaluation is needed if investigations, tests, and petrographic examinations of aggregates performed in accordance with ASTM C295-54, ASTM C227-50, or ACI 201.2R-77 (NUREG-1557) demonstrate that the aggregates are reactive. "

BFN Response

For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See discussion of Further Evaluation in **3.5.2.2.2.1**.

2.1.8.4 ISG-04, Aging Management of Fire Protection Systems for License Renewal

The following presents the NRC staff's positions and the BFN response for this final ISG.

Staff Position for Wall Thinning of FP Piping Due to Internal Corrosion

"... Therefore, the staff recommends that the applicant perform a baseline pipe wall thickness evaluation of the fire protection piping using a non-intrusive means of evaluating wall thickness, such as volumetric inspection, to detect this aging effect before the current license term expires. The staff also recommends that the applicant perform pipe wall thickness evaluations at plant-specific intervals during the period of extended operation. The plant-specific inspection intervals are determined by engineering evaluation performed after each inspection of the fire protection piping to detect degradation prior to the loss of intended function. As an alternative to pipe wall thickness evaluations, an applicant may use the existing Chapter XI.M27."

BFN Response

The fire protection sprinkler system piping will be evaluated for wall thickness (e.g., non-intrusive volumetric testing or plant maintenance visual inspections) to ensure that corrosion aging effects are managed and that wall thickness is within acceptable limits. These inspections are performed before the end of the current operating term and at plant specific intervals thereafter during the period of extended operation. See presentation of the Fire Water System Program in Section **B.2.1.24**.

Staff Position for Wall Thinning of Below Grade FP Piping Due to Internal Corrosion

"The staff acknowledges that some applicants may be able to demonstrate that the environmental and material conditions that exist on the interior surface of below grade FP piping are similar to the conditions that exist within the interior surface of the above grade FP piping. If an applicant makes such a demonstration, the staff agrees that the results of the interior inspections of the above grade FP piping can be extrapolated to evaluate the interior condition of the below grade FP piping. If not, additional inspection activities are needed to provide the reasonable assurance that the intended function of below grade FP piping will be maintained consistent with an applicant's current licensing basis for the period of extended operation."

BFN Response

The environmental and material conditions that exist on the interior surface of the below grade fire protection piping are similar to the conditions that exist within the above grade fire protection piping, the results of the inspections of the above grade fire protection piping will be extrapolated to evaluate the condition of below grade fire protection piping to ensure that the intended function of below grade fire protection piping will be maintained consistent with the current licensing basis for the period of extended operation. See presentation of the Fire Water System Program in Section **B.2.1.24**.

Staff Position for Testing of Sprinkler Heads

"The 50-year service life of sprinkler heads does not necessarily occur at the 50th year of operation in terms of licensing. The service life is defined from the time the sprinkler system is installed and functional. In most cases, sprinkler systems are in place several years before the operating license is issued. However, sprinkler systems in some plants may have been installed after the plant was placed in operation. The staff recommends, in accordance with NFPA 25, that sprinkler head testing should be performed at year 50 of sprinkler system service life, not at year 50 of plant operation, with subsequent sprinkler head testing every 10 years thereafter."

BFN Response

In accordance with NFPA 25, that sprinkler head testing should be performed at year 50 of sprinkler system service life with subsequent sprinkler head testing every 10 years thereafter. See the Fire Water System Program description in Section **B.2.1.24**.

Staff Position for Valve Line-up Inspections of Halon/Carbon Dioxide Fire Suppression Systems

"The staff reviewed these items and determined that a valve lineup inspection, charging pressure inspection, and an automatic mode of operation verification are operational activities pertaining to system or component configurations or properties that may change, and are not related to aging management. Therefore, the staff position is to revise NUREG-1801 to eliminate the halon/carbon dioxide system inspections for charging pressure, valve lineups, and automatic mode of operation."

BFN Response

System inspections for charging pressure, valve lineups, and automatic mode of operation are not credited as an AMP for license renewal. See the Fire Protection Program description in Section **B.2.1.23**.

2.1.8.5 ISG-05, Identification and Treatment of Electrical Fuse Holders for License Renewal

The following presents the NRC staff's positions and the BFN responses for this final ISG.

Staff Position

"Consistent with the requirements specified in 10 CFR 54.4(a), fuse holders (including fuse clips and fuse blocks) are considered to be passive electrical components. Fuse holders would be scoped, screened, and included in the aging management review (AMR) in the same manner as terminal blocks and other types of electrical connections that are currently being treated in the process. This staff position only applies to fuse holders that are not part of a larger assembly, but support safety-related and non safety-related functions in which the failure of a fuse precludes a safety function from being accomplished [10 CFR Part 54.4(a)(1) and (a)(2)]. Examples are fuses that are used as protective devices to ensure the integrity of containment electrical penetrations when they are challenged by electrical faults, or as isolation devices between Class 1E and non-Class 1E electrical circuits to ensure that the safety function is not compromised as a result of faults in the non-Class 1E circuits. An appropriate aging management program (AMP) should be adopted to manage the effects of aging where necessary."

BFN Response

BFN has determined that an aging management program is not necessary to manage the effects of aging of fuse holders using the following methodology:

a. Non-EQ fuses contained in BFN plant controlled component data base were identified.
b. All fuse holders were evaluated for the effects of moisture or chemical contamination, thermal cycling, vibration and mechanical stress. Only fatigue due to mechanical stress was found to be an applicable aging effect/mechanism at BFN.
c. Fuses not contained in an “in-scope” system were eliminated by utilizing the fuse “UNID” database field.
d. Remaining fuses contained in panels, cabinets, etc. with active components were eliminated by utilizing the “Location of Major Assembly” database field.
e. Remaining fuses that have been deleted, spared, abandoned, etc. were eliminated.
f. Eliminate remaining fuses that are actually contained in panels with active devices by utilizing connection drawings, schematics, and other drawings.
g. Remaining fuses with a Safety Classification/Augmented QA-code other than Safety-related (SR), Fire Protection (QR-Q07), or ATWS (QR-Q11) were eliminated.
h. An evaluation was performed to determine if the remaining fuses are subjected to frequent mechanical stresses. A fuse was determined to be subjected to frequent mechanical stress if it is routinely pulled; that is, removed/reinserted at least once every year.

See Section **3.6.2.3.1** for a summary of the results of the evaluation.

2.1.8.6 ISG-06, Identification and Treatment of Housings for Active Components

The BFN scoping methodology considered the guidance in this draft ISG. See AMR results in Section **3.0**.

2.1.8.7 ISG-07, Scoping Guidance for Fire Protection Systems, Structures, and Components

The BFN scoping methodology considered the guidance in this draft ISG. The BFN scoping methodology and results for fire protection are consistent with the BFN current licensing bases for fire protection. See Section **2.1.3**.

2.1.8.8 ISG-08, Updating the Improved Guidance Documents - ISG to Establish the ISG Appeals Process

This is an administrative draft ISG that has no impact on the BFN license renewal application.

2.1.8.9 ISG-09, Scoping Criteria 10 CFR 54.4(a)(2)

The BFN scoping methodology considered the guidance in this draft ISG. See Section **2.1.2.2**.

2.1.8.10 ISG-10, Class of 2003 Standard License Renewal Format

The BFN license renewal application closely follows the Proposed Standard License Renewal format package dated May 2003. In addition, CLB differences between Unit 1 and Units 2 and 3 are identified in the text and the planned resolution of the differences during the Unit 1 restart are explained in an additional Appendix (Appendix **F**, Integration of Browns Ferry Unit 1 Restart and License Renewal Activities).

2.1.8.11 ISG-11, Aging Management of Environmental Fatigue for Carbon/Low-Alloy Steel

The BFN AMR methodology considered the guidance in this draft ISG. See discussion of effects of reactor coolant environment on austenitic stainless steel and Ni-Fe-Cr high nickel alloy component location fatigue life for license renewal in Section **4.3.4**.

2.1.8.12 ISG-12, Operating Experience with Cracking of Class 1 Small-Bore Piping

This potential issue was identified as an ISG on May 29, 2002, Public Meeting. Its status is “On hold” with no activity. See Section **3.1** for BFN further evaluation of the Class 1 Small-Bore Piping aging management.

2.1.8.13 ISG-13, Management of Loss of Preload on Reactor Vessel Internals Bolting Using the Loose Parts Monitoring System

This issue is not applicable to BFN since BFN is a BWR and does not have a Loose Parts Monitoring System.

2.1.8.14 ISG-14, Operating Experience with Cracking in Bolting

The NRC has not developed a position for this issue. The BFN Bolting Integrity aging management program is consistent with the NUREG-1801 Volume 2 XI.M18 program description and evaluation (**B.2.1.16**).

2.1.8.15 ISG-15, ISG for AMP XI.E2 for Non-Environmental Qualification Cables Used in Instrumentation Circuits

The BFN scoping methodology considered the guidance in this draft ISG. See Section **B.2.1.2** for a description of BFN's AMP XI.E2 for Non-Environmental Qualification Cables Used in Instrumentation Circuits.

2.1.8.16 ISG-16, Time-Limited Aging Analyses Supporting Information for License Renewal Applications

The BFN scoping methodology considered the guidance in this draft ISG. See Section **4.2** for a description TLAA results for neutron embrittlement.

2.1.9 Generic Safety Issue Summary

This section identifies the Section in which the BFN response to the following Generic Safety Issues is presented.

GSI No.	GSI Title	Section No.
GSI-29	Bolting Degradation or Failure in Nuclear Power Plants	**B.2.1.16**
GSI-168	NRC Regulatory Issue Summary 2003-09[7] (Accession No. ML031220078), "Environmental Qualification of Low-Voltage Instrumentation and Control Cables	**4.4**
GSI-190	Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping	**4.3.4**

7 This issue had formerly been identified as GSI-168, "Environmental Qualification of Low Voltage Instrumentation & Control Cables."

2.2 PLANT LEVEL SCOPING RESULTS

Table **2.2.1** and Table **2.2.2** list the systems and structures that were evaluated to determine if they were within the scope of license renewal. A reference to the section of the application that contains the scoping and screening results is provided for each in-scope item on the Tables. For each item on the list that is not within the scope of license renewal, the tables provide a reference (if applicable) to the section of the Updated Final Safety Analysis Report that describes the system or structure.

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
	Reactor Vessel	Yes	Section 2.3.1.1
	Reactor Vessel Internals	Yes	Section 2.3.1.2
001	Main Steam	Yes	Section 2.3.4.1
002	Condensate and Demineralized Water	Yes	Section 2.3.4.2 System 002 subsystems include the Condensate Storage and Transfer subsystem and the Demineralized Water subsystem.
003	Feedwater	Yes	Section 2.3.4.3
004	Hydrogen Water Chemistry	No	UFSAR 10.23
005	Extraction Steam	No	UFSAR 11.2
006	Heater Drains & Vents	Yes	Section 2.3.4.4 and F.1
008	Turbine Drains & Miscellaneous Piping	Yes	Section 2.3.4.5 and F.1
009	Control Bay Panels	Yes	Sections 2.4 and 2.5. Table 2.2.1 Note 2
010	Reactor Vessel Vents & Drains	Yes	Section 2.3.1.3
012	Auxiliary Boiler	Yes	Section 2.3.3.1
018	Fuel Oil	Yes	Section 2.3.3.2
020	Lubricating Oil	No	Not described in UFSAR
021	Nitrogen Purging	No	UFSAR 5.2. Accident mitigation uses CAD (Section 2.3.2.7).
023	Residual Heat Removal Service Water	Yes	Section 2.3.3.3
024	Raw Cooling Water	Yes	Section 2.3.3.4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
025	Raw Service Water	Yes	Section 2.3.3.5
026	High Pressure Fire Protection	Yes	Section 2.3.3.6
027	Condenser Circulating Water	Yes	Section 2.3.4.6
028	Makeup Water Treatment	No	Not described in UFSAR
029	Potable Water	Yes	Section 2.3.3.7
030	Ventilation	Yes	Section 2.3.3.8
031	Heating, Ventilation, and Air Conditioning	Yes	Section 2.3.3.9
032	Control Air	Yes	Section 2.3.3.10
033	Service Air	Yes	Section 2.3.3.11
034	Vacuum Priming	No	UFSAR 11.6, Table 2.2.1 Note 1
035	Generator Hydrogen Cooling	No	UFSAR 8.2 and 11.2, Table 2.2.1 Note 1
036	Auxiliary Boiler Feed Water Treatment	No	Not described in UFSAR
037	Gland Seal Water	Yes	Section 2.3.4.7
038	Insulating Oil	No	Not described in UFSAR
039	CO_2	Yes	Section 2.3.3.12
040	Station Drainage	Yes	Section 2.3.3.13
041	Halon Fire Protection	No	Not described in UFSAR; used only in administrative areas outside the plant protected area.
043	Sampling and Water Quality	Yes	Section 2.3.3.14
044	Building Heat	Yes	Section 2.3.3.15
046	Feedwater Control	No	UFSAR 7.10

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
047	Turbine/Electro-Hydraulic Control	No	UFSAR **7.11**, Table 2.2.1 Note 1
049	Breathing Air	No	Not described in UFSAR
050	Raw Water Chemical Treatment	Yes	Section **2.3.3.16**
051	Raw Water Chlorination	No	Not described in UFSAR
052	Seismic Monitoring	No	UFSAR **2.5.5**
053	Demineralizer Backwash Air	Yes	Section **2.3.3.17**
055	Annunciators	No	UFSAR **2.5**, **5.3**, **7.2**, **7.3**, **7.4**, **7.5**, **7.7**, **7.9**, **7.16**, **8.1**, **8.8**, and **11.9**
056	Temperature Monitoring	No	Not described in UFSAR; non Safety-related monitors for Reactor Vessel shell temperatures and other miscellaneous applications.
057	Electrical Distribution	No	Subsystems of the electrical distribution system are listed in the System No. 200 series below.
058	Bio-Thermal Research Facility	No	Not described in UFSAR
063	Standby Liquid Control	Yes	Section **2.3.3.18**
064	Containment	Yes	Section **2.3.2.1** System 064 subsystems include the primary containment, the primary containment isolation system, the secondary containment, and the reactor building ventilation system.
065	Standby Gas Treatment	Yes	Section **2.3.2.2**
066	Off-Gas	Yes	Section **2.3.3.19**
067	Emergency Equipment Cooling Water	Yes	Section **2.3.3.20**

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
068	Reactor Recirculation	Yes	Section **2.3.1.4**
069	Reactor Water Cleanup	Yes	Section **2.3.3.21**
070	Reactor Building Closed Cooling Water	Yes	Section **2.3.3.22**
071	Reactor Core Isolation Cooling	Yes	Section **2.3.3.23**
072	Auxiliary Decay Heat Removal	Yes	Section **2.3.3.24** and **F.11**
073	High Pressure Coolant Injection	Yes	Section **2.3.2.3**
074	Residual Heat Removal	Yes	Section **2.3.2.4**
075	Core Spray	Yes	Section **2.3.2.5**
076	Containment Inerting	Yes	Section **2.3.2.6**
077	Radioactive Waste Treatment	Yes	Section **2.3.3.25**
078	Fuel Pool Cooling and Cleanup	Yes	Section **2.3.3.26**
079	Fuel Handling and Storage	Yes	Section **2.3.3.27**
080	Primary Cont/Temp Monitoring	No	UFSAR Figures **5.2-6b** and **5.2-6d** Table 2.2.1 Note 1
082	Diesel Generator	Yes	Section **2.3.3.28**
084	Containment Atmosphere Dilution	Yes	Section **2.3.2.7**
085	Control Rod Drive	Yes	Section **2.3.3.29**
086	Diesel Generator Starting Air	Yes	Section **2.3.3.30**
090	Radiation Monitoring	Yes	Section **2.3.3.31**
092	Neutron Monitoring	Yes	Section **2.3.3.32**
094	Traversing Incore Probe	Yes	Section **2.3.3.33**
096	Recirculation Flow Control	No	UFSAR **7.9**, Table 2.2.1 Note 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
097	Agriculture Waste Heat Supply	No	Not described in UFSAR
099	Reactor Protection	Yes	Section **2.5**
100	Penetrations and Sleeves	Yes	Evaluated as structural commodities. Section **2.4**
111	Cranes	Yes	Section **2.3.3.34**
112	Shop Equipment	No	Not described in UFSAR, Table 2.2.1 Note 1
202	4-kV Unit Boards	Yes	Section **2.5**
203	4-kV Common Boards	No	UFSAR **8.4**
204	4-kV Unit Start Board & Bus	Yes	Section **2.5**
205	4-kV Cooling Tower Switchgear	No	UFSAR **8.4**, Table 2.2.1 Note 1
206	4-kV Bio-Thermal Board	No	UFSAR Figure **8.4-1a**
210	4-kV Bus Tie Board	Yes	Section **2.5**
211	4-kV Shutdown Board and Buses	Yes	Section **2.5**
215	480-V Common Boards	No	UFSAR **8.4**, Table 2.2.1 Note 1
219	480-V Diesel Auxiliary Boards	Yes	Section **2.5**
225	480-V Unit Boards	No	UFSAR **8.4**, Table 2.2.1 Note 1
231	480-V Shutdown Boards	Yes	Section **2.5**
232	480-V Cooling Tower Boards	No	UFSAR **8.4.5**
233	480-V Biothermal Boards	No	Not described in UFSAR
236	Main Transformers	Yes	Section **2.5**
237	480-V Service Building Main Board	No	Not described in UFSAR

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
238	480-V Transformers Yard Distribution	No	Not described in UFSAR
239	480-V Lighting Boards	No	UFSAR **8.7**, Table 2.2.1 Note 1
240	480-V Water Supply Board	No	Not described in UFSAR, Table 2.2.1 Note 1
241	161-kV Switchyard	Yes	Section **2.5**
242	Main Generator	Yes	Section **2.5**
243	Unit Station Service Transformer	Yes	Section **2.5**
244	Communications	Yes	Section **2.5**
245	Common Station Service Transformer	Yes	Section **2.5**
246	Cooling Tower Transformer	No	UFSAR **8.3** and **8.4**
247	Emergency Lighting	Yes	Section **2.5**
248	250-V DC	Yes	Section **2.5**
249	Plant Preferred 120V AC	No	UFSAR **8.7**, Table 2.2.1 Note 1
250	Plant Non-Preferred 120V	No	UFSAR **8.7**, Table 2.2.1 Note 1
251	48-V DC Power	No	UFSAR **8.8.1**, Table 2.2.1 Note 1
252	Unit Preferred 120V AC	No	UFSAR **8.7**, Table 2.2.1 Note 1
253	120-V AC Instrument & Control Power	Yes	Section **2.5**
254	Diesel 125-V DC	Yes	Section **2.5**
255	Data Logger	No	UFSAR **2.3**
256	ECCS Analog Trip Unit Inverters	Yes	Section **2.5**
258	Operation Recorder	No	Not described in UFSAR

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
259	480-V Load Shedding Logic	Yes	Section 2.5
260	Security	No	Security feature not described in UFSAR. Table 2.2.1 Note 1
261	Process Computer	No	UFSAR 7.16, Table 2.2.1 Note 1
262	Generator Bus Duct Cooling	No	UFSAR 8.2
265	480-V Reactor Building Vent Boards	No	UFSAR 8.5
266	480-V Control Bay Vent Board	Yes	Section 2.5
267	480-V Turbine Building Motor Operated Valves Board	No	UFSAR 8.4
268	480-V Reactor Motor Operated Valves Boards	Yes	Section 2.5
269	480-V Turbine Building Motor Operated Valves Board	No	UFSAR 8.4
270	480-V Condensate Demineralizer Board	No	UFSAR 8.4, Table 2.2.1 Note 1
271	480-V Auxiliary Boiler Boards	No	Not described in UFSAR
272	480-V Water and Oil Storage Boards	No	Not described in UFSAR
273	480-V Radwaste Boards	No	UFSAR 8.4
274	480-V Service Buildings Vent	No	Not described in UFSAR
275	480-V Office Buildings Vent Board	No	Not described in UFSAR
276	480-V Power Cabinets	No	Not described in UFSAR
277	Gatehouse Panel Board	No	Not described in UFSAR
278	Distribution Cabinets	No	UFSAR 8.4

Table 2.2.1 Systems Scoping Results

System Number	System Name	In-scope?	Comments
280	Battery Boards	Yes	Section **2.5**
281	250-V Reactor Motor Operated Valves Boards	Yes	Section **2.5**
282	250-V DC Distribution Boards	Yes	Section **2.5**
283	24-V DC Power	No	UFSAR **8.8.2,** Table 2.2.1 Note 1
285	Computer Uninterruptible Power Supply	No	Not described in UFSAR
301	Sewage	No	UFSAR **10.15,** Table 2.2.1 Note 1
302	Elevator	No	Not described in UFSAR, Table 2.2.1 Note 1
303	Civil/Structure	Yes	Table **2.2.2** presents scoping results for individual structures.
304	Fuse Failure Alarm	No	Not described in UFSAR, Table 2.2.1 Note 1
410	Building Doors and Hatches	No	Components (e.g. fire doors) in in-scope structures are evaluated as structural commodities. See Section **2.4**.
420	Yard	No	UFSAR **1.6**
925	25 Series Panels	No	Not described in UFSAR. Sections **2.4** and **2.5**. Table 2.2.1 Note 2

Table 2.2.1 Notes

Note 1 As discussed in NUREG-1800 Section 2.2.3.1, system electrical isolation devices separating the system from an in-scope system have been evaluated as electrical commodities, even though the system is not in-scope. See Section **2.5** for presentation of the screening results for electrical commodities.

Note 2 The performance of these panels will be monitored by the various systems of the equipment mounted external and internal to these panels. Components in systems 009 and 925 are evaluated as civil and electrical commodities. The civil commodities are addressed in Section **2.4**. The electrical commodities are addressed in Section **2.5**.

Table 2.2.2 Structures Scoping Results

Structure Name	In-scope?	Comments
Reactor Buildings (Units 1, 2,and 3)	Yes	Section 2.4.2.1. (The Control Bay is included within the structure of the Reactor Buildings.)
Primary Containment Structure (Units 1, 2,and 3)	Yes	Section 2.4.1.1
Diesel Generator Buildings (Units 1&2 and Unit 3)	Yes	Section 2.4.3.1
Intake Pumping Station	Yes	Section 2.4.4.1
Reinforced Concrete Chimney	Yes	Section 2.4.6.1
Standby Gas Treatment Building	Yes	Section 2.4.3.2
Off-Gas Treatment Building	Yes	Section 2.4.3.3
Equipment Access Lock	Yes	Section 2.4.2.2
Vacuum Pipe Building	Yes	Section 2.4.3.4
Vacuum Pump Building	No	UFSAR 12.2.7
Turbine Buildings (Units 1, 2,and 3)	Yes	Section 2.4.7.1
Radwaste Building	No	UFSAR 12.2.5
Office Building	No	UFSAR 12.2.6
Service Building	No	UFSAR 12.2.6
Hydrogen Trailer Port Structure	No	UFSAR 12.2.11
Vent Vaults	Yes	Section 2.4.7.3
Guardhouse	No	UFSAR 12.2.12
Radwaste Evaporator Building	No	UFSAR 12.2.15
Plant Engineering Complex	No	Not described in UFSAR
Security Diesel Building	No	Not described in UFSAR

Table 2.2.2 Structures Scoping Results

Structure Name	In-scope?	Comments
Cooling Tower Pumping Stations No. 1-6	No	Not described in UFSAR
Cooling Towers	No	UFSAR 12.2.7
Cooling Tower Bypass Outlets	No	Not described in UFSAR.
Cooling Tower 480V Substations	No	Not described in UFSAR.
Gate Structure No. 1	No	UFSAR 12.2.7
Gate Structure No. 1A	No	Not described in UFSAR
Gate Structure No. 1B	No	Not described in UFSAR
Gate Structure No. 3	Yes	Section 2.4.4.2
Gate Structure No. 2	No	UFSAR 12.2.7
Discharge Structure	No	UFSAR 12.2.7
Discharge Control Structure	No	UFSAR 12.2.7
Circulating Water Conduits	No	UFSAR 12.2.7
Diesel High Pressure Fire Pump House	Yes	Section 2.4.7.2
Sewage Treatment Facility	No	Not described in UFSAR
Sewage Analysis House	No	Not described in UFSAR
Sewage Lift Station	No	Not described in UFSAR
Radiation Monitoring Building	No	Not described in UFSAR
NRC Building (Old Guardhouse)	No	Not described in UFSAR
Communication Building	No	Not described in UFSAR
Bio-Thermal Research Facility	No	Not described in UFSAR
Low-Temp Pumping Station for Bio-Thermal Research	No	Not described in UFSAR

Table 2.2.2 Structures Scoping Results

Structure Name	In-scope?	Comments
Hot Pump Wells Bio-Thermal Research Facility	No	Not described in UFSAR
Dewatering Facility	No	Not described in UFSAR
East Access Control Portal	No	Not described in UFSAR
West Access Control Portal	No	Not described in UFSAR
Sample and Water Quality Building	No	Not described in UFSAR
Raw Water Treatment Facility	No	Not described in UFSAR
Auxiliary Raw Cooling Water Supply Pump Station	No	Not described in UFSAR
Auxiliary Decay Heat Removal Cooling Towers	No	Not described in UFSAR
Auxiliary Decay Heat Removal Motor Control Center Building	No	Not described in UFSAR
Ecolochem Building	No	Not described in UFSAR
Hypochlorite Building	No	Not described in UFSAR
Central Alarm Station Building	No	Not described in UFSAR
Secondary Alarm System Building	No	Not described in UFSAR
Training and Visitor Center	No	Not described in UFSAR
Material Storage Warehouse	No	Not described in UFSAR
Radwaste Storage Building	No	Not described in UFSAR
Low Level Radwaste Storage Facility	No	UFSAR **12.2.17**
Fire Equipment House and Valve Pit	No	Not described in UFSAR
Uninterruptible Power Supply Building	No	Not described in UFSAR
CFC Building	No	Not described in UFSAR

Table 2.2.2 Structures Scoping Results

Structure Name	In-scope?	Comments
Field Service Building	No	Not described in UFSAR
Paint and Sandblast Shop	No	Not described in UFSAR
Outage Fabrication Shop	No	Not described in UFSAR
Isolation Valve Pits	No	Not described in UFSAR
Plant Maintenance Building	No	Not described in UFSAR
WSP Office Building	No	Not described in UFSAR
Water and Oil Storage Building	No	Not described in UFSAR
Common Maintenance Building	No	Not described in UFSAR
Fish Collection Facility	No	Not described in UFSAR
Telephone Equipment House	No	Not described in UFSAR
Material and Procurement Complex	No	Not described in UFSAR
Trash Pipe Bridge	No	Not described in UFSAR
Meteorological Tower	No	Not described in UFSAR
Meteorological Monitoring Building	No	Not described in UFSAR
Facilities Maintenance Warehouse	No	Not described in UFSAR
Flammable Liquids Building	No	Not described in UFSAR
Facilities Maintenance Chemical Storage Building	No	Not described in UFSAR
Facilities Maintenance Warehouse	No	Not described in UFSAR
Fire Equipment and Yard Storage Building	No	Not described in UFSAR
Transformer Yard	Yes	Section **2.4.7.4**
161 kV Switchyard	Yes	Section **2.4.7.5**
500 kV Switchyard	Yes	Section **2.4.7.6**

Table 2.2.2 Structures Scoping Results

Structure Name	In-scope?	Comments
161 kV Capacitor Yard	No	Not described in UFSAR
4 kV Capacitor Yard	No	Not described in UFSAR
Shunt Reactor Yard	No	Not described in UFSAR
Condensate Water Storage Tanks' Foundations and Trenches	Yes	Section 2.4.5.1
Nitrogen Storage Tank Foundation	No	Not described in UFSAR
Lube Oil Storage Tanks' Foundations	No	Not described in UFSAR
Demineralized Water Storage Tank Foundation	No	Not described in UFSAR
Transformer Oil Storage Foundation	No	Not described in UFSAR
Fuel Oil Storage Tanks' Foundations	No	Not described in UFSAR
Containment Atmosphere Dilution Storage Tanks' Foundations	Yes	Section 2.4.5.2
Acid Storage Area & Chemical Injection System Tank Foundation	No	Not described in UFSAR
Cool Water Channel	No	UFSAR 12.2.7
Intake Channel	Yes	Section 2.4.4.3
North Bank of the Cool Water Channel East of Gate Structure No. 2	Yes	Section 2.4.4.4
South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3	Yes	Section 2.4.4.5
Warm Water Channel	No	UFSAR 12.2.7
Switchyard Drain Channel	No	Not described in UFSAR
Sewage Treatment Lagoon	No	Not described in UFSAR
Earth Berm	Yes	Section 2.4.3.8

Table 2.2.2 Structures Scoping Results

Structure Name	In-scope?	Comments
Residual Heat Removal Service Water Tunnels	Yes	Section 2.4.3.5
Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse	Yes	Section 2.4.3.6
Underground Concrete Encased Structures	Yes	Section 2.4.3.7
Plant Administration Building	No	Not described in UFSAR
North and South Administration Building	No	Not described in UFSAR
East Access Facility	No	Not described in UFSAR
South Access Facility	No	Not described in UFSAR
Diesel Fire Pump Building	No	Not described in UFSAR

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

The determination of mechanical systems within the scope of license renewal has been made by initially identifying Browns Ferry mechanical systems and then reviewing them to determine which ones satisfy one or more of the criteria contained in 10 CFR 54.4. This process is described in Section **2.1** and the results of the mechanical systems review contained in Section **2.2**. Section **2.1** also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section by component type. These identified component types subsequently require an AMR for license renewal.

The screening results are provided below in four subsections:

- Reactor Coolant Systems
- Engineered Safety Features Systems
- Auxiliary Systems
- Steam and Power Conversion Systems

2.3.1 Reactor Coolant Systems

The Reactor Coolant Systems act to contain or transport the fluids coming from or going to the reactor core. The scoping and screening results for the following systems are included in this section:

Section	System Number	System Name
2.3.1.1		Reactor Vessel
2.3.1.2		Reactor Vessel Internals
2.3.1.3	010	Reactor Vessel Vents and Drains
2.3.1.4	068	Reactor Recirculation

Portions of the systems listed below also form the reactor coolant pressure boundary (RCPB). The scoping and screening results for these systems are presented in the listed subsections.

Section	System Number	System Name
2.3.3.14	043	Sampling and Water Quality
2.3.2.3	073	High Pressure Coolant Injection
2.3.2.4	074	Residual Heat Removal
2.3.2.5	075	Core Spray
2.3.3.18	063	Standby Liquid Control
2.3.3.21	069	Reactor Water Cleanup
2.3.3.23	071	Reactor Core Isolation Cooling
2.3.3.29	085	Control Rod Drive
2.3.4.1	001	Main Steam
2.3.4.3	003	Feedwater

For the systems listed above, the RCPB extends to the outer-most primary containment isolation valve as defined in UFSAR Section **5.2.3.5**.

2.3.1.1 Reactor Vessel

System Description

The Reactor Vessel provides a volume in which the core is submerged in coolant. The Reactor Vessel is unique to each unit. The Reactor Vessel is a vertical, cylindrical pressure vessel with hemispherical heads of welded construction. The cylindrical shell and bottom hemispherical head of the reactor vessel are fabricated of low alloy carbon steel plate that is clad on the interior with weld overlay. The cylindrical shell is clad with stainless steel, and the bottom hemispherical head is clad with Inconel. The vessel top head is not clad and is secured to the reactor vessel by studs and nuts. The vessel flanges are sealed by two concentric metallic seal-rings designed for no detectable leakage through the inner or outer seal at any operating condition. The reactor vessel has penetrations (nozzles) for:

- Recirculation Outlet
- Steam Outlet
- Recirculation Inlet
- Feedwater (FW) Inlet
- Core Spray (CS) Inlet
- Head Spray inlet
- Control Rod Drive (CRD)
- Jet Pump Instrumentation
- Vent
- Instrumentation
- CRD Hydraulic System Return (capped)
- Core Differential Pressure and Liquid Control
- Drain
- In-Core Flux Instrumentation
- Head Seal Leak Detection
- Spare Instrument

Intergranular Stress Corrosion Cracking mitigation measures have been implemented (Section F.5).

The Reactor Vessel is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Reactor Vessel intended functions are:

- Form part of the RCPB
- Provide physical support for the reactor core and the reactor vessel internals
- Ensure a floodable volume and coolant distribution to mitigate accidents

UFSAR References

Additional detail for the Reactor Vessel is found in UFSAR **4.2**, **7.8**, and Appendices **J**, **K**, and **L**.

License Renewal Drawings

The license renewal drawings for the Reactor Vessel are listed below:

1-47E801-1-LR
1-47E803-1-LR
1-47E811-1-LR
1-47E814-1-LR
1-47E817-1-LR
1-47E854-1-LR

2-47E801-1-LR
2-47E803-5-LR
2-47E811-1-LR
2-47E814-1-LR
2-47E817-1-LR
2-47E854-1-LR

3-47E801-1-LR
3-47E803-1-LR
3-47E803-5-LR
3-47E811-1-LR
3-47E814-1-LR
3-47E817-1-LR
3-47E854-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.1.1, Reactor Vessel.

The aging management review results for these component types are provided in Table **3.1.2.1**, Reactor Vessel - Summary of Aging Management Evaluation.

Table 2.3.1.1 Reactor Vessel

Component Type	Intended Functions
Attachments and Welds	PB, SS
Closure Studs and Nuts	PB
Heads, Flanges, Shell	PB, SS
Nozzles Safe Ends	PB
Nozzles	PB
Other External Attachments	PB, SS
Penetrations	PB, SS
Refueling Bellows Support Skirt	PB, SS
Stabilizer Bracket	PB, SS
Support Skirt and Attachment Welds	SS

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.1.2 Reactor Vessel Internals

System Description

The Reactor Vessel Internals provide:

- Partitions between regions within the reactor vessel to provide proper coolant distribution, thereby allowing power operation without fuel damage due to inadequate cooling.
- Positioning and support for the fuel assemblies, control rods, incore flux monitors, and other components to assure that control rod movement is not impaired.
- A floodable volume in which the core can be adequately cooled if there is a breach in the nuclear system process barrier external to the reactor vessel.

The Reactor Vessel Internals are unique to each unit. The Reactor Vessel Internals are the following components:

- Core shroud - The core shroud is a stainless steel cylinder that provides a partition to separate the upward flow of coolant through the core from the downward recirculation flow. This partition separates the core region from the downcomer annulus, thus providing a floodable region, following a recirculation line break.
- Shroud head and steam separator assembly - The shroud head and steam separator assembly is bolted to the top of the upper shroud to form the top of the core discharge plenum. This plenum provides a mixing chamber for the steam-water mixture before it enters the individual steam separators. In each separator, the steam-water mixture rising through the standpipe passes vanes that impart a spin to establish a vortex separating the water from the steam.
- Core support (core plate) - The core support provides lateral support and guidance for the control rod guide tubes, peripheral fuel support pieces, incore flux monitor guide tubes, and startup neutron sources.
- Top guide - The top guide is formed by a series of stainless steel beams joined at right angles to form square openings. Each opening provides lateral support and guidance for four fuel assemblies. Detent sockets are provided beneath the top guide to anchor dry tubes, power range monitor incore detectors, and neutron sources.
- Fuel support pieces - The fuel support pieces are of two basic types - peripheral and four-lobed. The peripheral fuel support pieces, which are welded to the core support, are located at the outer edge of the active core and are not adjacent to control rods. Each peripheral fuel support piece supports one fuel assembly and contains a replaceable orifice assembly designed to assure proper coolant flow to the fuel assembly. Each four-lobed fuel support piece supports four fuel assemblies and has orifice plates to assure proper coolant flow distribution to each fuel assembly. The four-lobed fuel support pieces rest in the top of the control rod guide

tubes and are supported laterally by the core support. The control rod blades pass through slots in the center of the four-lobed fuel support pieces.

- Control rod guide tubes (Control rod housing) - Each control rod guide tube is designed as the lateral guide for a control rod and as the vertical support for a control rod, CRD, four-lobed fuel support piece, and the four fuel assemblies surrounding the control rod.
- Jet pump assemblies - The jet pump assemblies are located in two semicircular groups in the downcomer annulus between the core shroud and the reactor vessel wall. Each jet pump consists of a driving nozzle, suction inlet, throat or mixing section, and diffuser. The driving nozzle, suction inlet, and throat are joined as a removable unit and the diffuser is permanently installed. High pressure water from the recirculation pumps is supplied to each pair of jet pumps through a riser pipe welded to the recirculation inlet nozzle thermal sleeve. A riser brace is welded to cantilever beams extending from pads on the reactor vessel wall.
- Steam dryers - The steam dryer removes moisture from the wet steam that exits from the steam separator.
- Feedwater spargers - Feedwater flow enters the center of the sparger and is discharged radially inward and downward through the nozzles to mix the cooler FW with the downcomer flow from the steam separators before it contacts the vessel wall. The FW flow also serves to collapse the steam voids and to subcool the water flowing to the jet pumps and recirculation pumps.
- Core spray lines and spargers - Two 100-percent capacity CS lines separately enter the reactor vessel through the two CS nozzles. The lines divide immediately inside the reactor vessel. The two halves are routed to opposite sides of the reactor vessel and are supported by clamps attached to the vessel wall. The header halves are then routed downward into the downcomer annulus and pass through the upper shroud into a semicircular sparger ring, which is routed halfway around the inside of the upper shroud. The proper spray distribution pattern is provided by a combination of distribution nozzles pointed radially inward and downward from the sparger rings.
- Vessel head spray nozzle - The vessel head spray nozzles are installed, but not used (Section **F.8**).
- Differential pressure and liquid control line - The differential pressure and liquid control line serves dual functions to inject liquid control solution into the coolant stream and to sense the differential pressure across the core support assembly.
- Incore flux monitor guide tubes - The incore flux monitor guide tubes are welded to the top of the incore flux monitor housings in the lower plenum and extend up to the top of the core support. The local power range detector assemblies for the power range monitoring units and the dry tubes for the source range monitoring and intermediate range monitoring detectors are inserted through the guide tubes and are held in place below the top guide by spring tension.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

- Startup neutron sources - Startup neutron sources are used to provide a sufficient neutron population to assure that the core neutron flux is detectable by installed neutron monitors. The startup neutron sources assure that significant changes in core reactivity are readily detectable by installed neutron flux instrumentation, if spent fuel alone cannot provide the required neutron population.
- Surveillance sample holders - The surveillance sample holders are welded baskets containing impact and tensile specimens' capsules. The baskets hang from brackets on the inside diameter of the reactor vessel at the mid height of the active core and at locations chosen to expose the specimens to the same environment and maximum neutron flux experienced by the reactor vessel itself.

The Reactor Vessel Internals System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Reactor Vessel Internals intended functions are:

- Provide physical support for the reactor core and the reactor vessel internals
- Ensure a floodable volume and coolant distribution to mitigate accidents

UFSAR References

Additional detail for the Reactor Vessel Internals System is found in UFSAR **3.3**, **4.2**, and Appendices **J**, **K**, and **L**.

License Renewal Drawings

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

1-47E814-1-LR **2-47E814-1-LR** **3-47E814-1-LR**
1-47E817-1-LR **2-47E817-1-LR** **3-47E817-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.1.2, Reactor Vessel Internals.

The aging management review results for these component types are provided in Table **3.1.2.2**, Reactor Vessel Internals - Summary of Aging Management Evaluation.

Table 2.3.1.2 Reactor Vessel Internals

Component Type	Intended Functions
Core shroud and plate	PB, SS
Core spray lines and spargers	SS, PB, SPR
CRD Housing	PB, SS
Dry tubes and Guide tubes	SS, PB
Fuel support	SS
Jet pump assemblies	SS, PB
Top Guide	SS

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.1.3 Reactor Vessel Vents and Drains System (010)

System Description

The Reactor Vessel Vents and Drains System consists of the Reactor Vessel head vent piping, the Reactor Vessel bottom head drain piping, and the blowdown piping from the Main Steam Relief Valves (MSRV) to the pressure suppression chamber. The Reactor Vessel Vents and Drains System for each unit share no components with the other units. The Reactor Vessel Vents and Drains System consist of valves and piping connecting to the RCPB. All piping and components are located within the primary containment.

The Reactor Vessel Vents and Drains System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Reactor Vessel Vents and Drains System intended functions are:

- Provide path for MS System, Safety Relief Valves (SRVs), steam blowdown to primary containment suppression pool
- Provide RCPB

The portions of the Reactor Vessel Vents and Drains System that contain components requiring an AMR consist of valves and piping that are part of, or connect to, the RCPB and terminate at closed valves, the suppression pool (MSRVs blowdown lines) or other systems' interfaces (RWCU System for bottom drains and MS System for the head vent).

UFSAR References

Additional description of the Reactor Vessel Vents and Drains System is contained in UFSAR **4.11, 7.8**, and **C.2**.

License Renewal Drawings

The license renewal drawings for the Reactor Vessel Vents and Drains System are listed below:

1-47E817-1-LR **2-47E817-1-LR** **3-47E817-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.1.3, Reactor Vessel Vents and Drains.

The aging management review results for these component types are provided in Table **3.1.2.3**, Reactor Vessel Vents and Drains System (010) – Summary of Aging Management Evaluation.

Table 2.3.1.3 Reactor Vessel Vents and Drains System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	PB
Piping	PB
Piping - RCPB	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.1.4 Reactor Recirculation System (068)

System Description

The Reactor Recirculation System provides:

- Sufficient subcooled water to the reactor core during normal operations to maintain normal core operating temperatures.
- Control of reactor power by varying recirculation flow during normal operations.
- A flow path for Low Pressure Coolant Injection flow from the Residual Heat Removal (RHR) System to the reactor vessel during design basis accidents.
- A flow path to and from the RHR System for decay heat removal at low temperatures.

The Reactor Recirculation System for each unit shares no components with the other units. The Reactor Recirculation System consists of two piping loops connected to, but external to, the reactor vessel. The recirculation loops for Units 1 and 2 have normally closed interconnections. Each loop has a single variable-speed motor-driven pump with pump suction and discharge valves. Each pump takes suction from the reactor vessel downcomer region and discharges into a manifold that supplies flow to ten jet pumps internal to the reactor vessel.

Intergranular Stress Corrosion mitigation measures have been implemented (Section **F.5**).

The recirculation loops for Unit 1 are being replaced with IGSCC resistant piping. During the replacement, the interconnection between the two Unit 1 recirculation loops will be removed.

The Reactor Recirculation System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	Yes	No

The Reactor Recirculation System Intended functions are:

- Provide RCPB
- Provide primary containment boundary

The portions of the Reactor Recirculation System that contain components that require an AMR extend from the Reactor Vessel outlet nozzle, through the valves and pumps, to the Reactor Vessel inlet nozzle. Also included are components within the Reactor Recirculation M-G Set Oil System and instrument tubing and piping outside the drywell. Reactor Recirculation System components within the Reactor Vessel are described in the Reactor Vessel Internals (Section **2.3.1.2**).

UFSAR References

Additional description of the Reactor Recirculation System is contained in UFSAR 3.7.6, 4.3, 5.2.3, 7.8, 7.9, and 7.19.

License Renewal Drawings

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

1-47E817-1-LR	2-47E817-1-LR	3-47E817-1-LR
1-47E820-2-LR	2-47E820-2-LR	3-47E817-2-LR
1-47E822-1-LR	2-47E822-1-LR	3-47E820-2-LR
	2-47E844-2-LR	3-47E822-1-LR

System Components/Commodities Requiring AMR

The component types that require aging management review are indicated in Table 2.3.1.4, Reactor Recirculation System.

The aging management review results for these component types are provided in Table 3.1.2.4, Reactor Recirculation System (068) – Summary of Aging Management Evaluation.

Table 2.3.1.4 Reactor Recirculation System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	FR, PB
Flexible Connectors	PB
Heat Exchangers	PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Reactor Coolant Pumps	PB
Restricting Orifice	FR, PB
Restricting Orifice - RCPB	FR, PB
Strainers	PB
Tanks	PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.2 Engineered Safety Features

The Engineered Safety Feature (ESF) Systems function under accident conditions to minimize the severity of an accident or mitigate the consequences of an accident. The ESF Systems provide emergency coolant to the core and minimize the release of radioactivity from the containment. The following systems are included in this subsection:

Section	**System Number**	**System Name**
2.3.2.1	064	Containment
2.3.2.2	065	Standby Gas Treatment
2.3.2.3	073	High Pressure Coolant Injection
2.3.2.4	074	Residual Heat Removal
2.3.2.5	075	Core Spray
2.3.2.6	076	Containment Inerting
2.3.2.7	084	Containment Atmosphere Dilution

The Emergency Core Cooling System (ECCS) Automatic Depressurization function uses the MSRVs in the Main Steam (MS) System. The scoping and screening results for the Automatic Depressurization function components are presented in Section **2.3.4.1**, Main Steam System.

2.3.2.1 Containment System (064)

System Description

The Containment System includes the following subsystems: the Primary Containment and the Primary Containment Isolation System, the Secondary Containment, and the Reactor Building Ventilation System. The scoping and screening results for primary containment isolation valves for the various processes are presented with their system. The results of scoping and screening evaluations for the following components (valves, piping, penetrations, structural steel, etc.) that are essential for primary containment integrity are presented in the following sections of this application:

Section	System Number	System Name
2.3.4.1	001	Main Steam
2.3.4.2	002	Condensate And Demineralized Water
2.3.4.3	003	Feedwater
2.3.3.10	032	Control Air
2.3.3.11	033	Service Air
2.3.3.14	043	Sampling And Water Quality
2.3.3.18	063	Standby Liquid Control
2.3.2.2	065	Standby Gas Treatment
2.3.1.4	068	Reactor Recirculation
2.3.3.21	069	Reactor Water Cleanup
2.3.3.22	070	Reactor Building Closed Cooling Water
2.3.3.23	071	Reactor Core Isolation Cooling
2.3.2.3	073	High Pressure Coolant Injection
2.3.2.4	074	Residual Heat Removal
2.3.2.5	075	Core Spray
2.3.2.6	076	Containment Inerting
2.3.3.25	077	Radioactive Waste Treatment
2.3.2.7	084	Containment Atmosphere Dilution
2.3.3.29	085	Control Rod Drive
2.3.3.31	090	Radiation Monitoring
2.3.3.33	094	Traversing In-Core Probe
2.4.1.1	None	Primary Containment Structure

The results of scoping and screening evaluations for the following components (valves, piping, penetrations, structural steel, etc.) that are essential for secondary containment integrity are presented in the following sections of this application:

Section	System Number	System Name
2.3.4.1	001	Main Steam
2.3.4.2	002	Condensate and Demineralized Water
2.3.4.3	003	Feedwater
2.3.3.1	012	Auxiliary Boiler
2.3.3.3	023	Residual Heat Removal Service Water
2.3.3.4	024	Raw Cooling Water
2.3.3.5	025	Raw Service Water
2.3.3.6	026	High Pressure Fire Protection
2.3.3.7	029	Potable Water
2.3.3.8	030	Ventilation
2.3.3.9	031	Heating, Ventilation, and Air Conditioning
2.3.3.10	032	Control Air
2.3.3.11	033	Service Air
2.3.4.7	037	Gland Seal Water
2.3.3.13	040	Station Drainage
2.3.3.14	043	Sampling and Water Quality
2.3.3.15	044	Building Heat
2.3.3.17	053	Demineralizer Backwash Air
2.3.2.2	065	Standby Gas Treatment
2.3.3.20	067	Emergency Equipment Cooling Water
2.3.3.21	069	Reactor Water Cleanup
2.3.3.22	070	Reactor Building Closed Cooling Water
2.3.3.23	071	Reactor Core Isolation Cooling
2.3.3.24	072	Auxiliary Decay Heat Removal
2.3.2.3	073	High Pressure Coolant Injection
2.3.2.4	074	Residual Heat Removal
2.3.2.5	075	Core Spray
2.3.2.6	076	Containment Inerting
2.3.3.25	077	Radioactive Waste Treatment
2.3.3.26	078	Fuel Pool Cooling
2.3.2.7	084	Containment Atmosphere Dilution
2.3.3.29	085	Control Rod Drive

Section	System Number	System Name
2.3.3.31	090	Radiation Monitoring
2.4.2.1	None	Reactor Buildings

Each unit employs an independent Pressure Suppression Primary Containment System that houses the reactor vessel, the reactor coolant recirculation loops, and other branch connections of systems that form the RCPB. The Mark I Pressure Suppression System consists of a drywell, a pressure suppression chamber (alternatively referred to as the torus or wetwell) which stores a large volume of water, a connecting vent system between the drywell and the pressure suppression chamber, isolation valves, equipment for establishing and maintaining a pressure differential between the drywell and pressure suppression chamber, and other service equipment. If there were a process system piping failure within the drywell, reactor water and steam would be released into the drywell air space. The resulting increased drywell pressure would then force a mixture of air, steam, and water through the vents into the pool of water that is stored in the pressure suppression chamber. The steam would condense rapidly and completely in the pressure suppression pool, resulting in rapid pressure reduction in the drywell. Air that is transferred to the pressure suppression chamber pressurizes the chamber and is subsequently vented to the drywell to equalize the pressure between the two vessels. Cooling systems are provided to remove heat from the drywell and from the water in the pressure suppression chamber, thus cooling and controlling the pressure in the primary containment under accident conditions. The drywell may be flooded, if necessary, by the Standby Coolant Supply (a cross-connection between the RHR Service Water and the RHR System) if all other cooling mechanisms are lost.

Valves and flow paths are provided to control internal and torus/drywell differential pressure.

If long-term cooling capability is lost post-accident resulting in a pressure increase that would jeopardize the structural integrity of the primary containment, a hardened wetwell vent to the plant stack can be opened to relieve the pressure increase (Section F.9).

The Containment System also includes the Secondary Containment System. The Secondary Containment System provides:

- An essentially leak tight envelope for any radiation release from the primary containment during design basis accidents.
- A primary envelope for radiation releases when the primary containment systems are open for refueling or maintenance.

The secondary containment envelope is provided by the Reactor Buildings structure. The Reactor Buildings structure is divided into three reactor zones and a refueling zone. A reactor zone for a unit houses the reactor, the primary containment, and the unit's ECCS, along with numerous Auxiliary systems. The Reactor Buildings structure also contains a Spent Fuel Storage Pool for each unit. The refueling zone allows continuous access to the

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

three Spent Fuel Storage Pools and access to each reactor vessel for refueling and servicing.

The Containment System also includes the Reactor Building Ventilation System. The reactor building is heated, cooled, and ventilated during normal and shutdown operation by a circulating air system. The reactor building ventilation system is shut down and isolated when a zone of secondary containment is isolated and connected to the Standby Gas Treatment (SGT) System. The Ventilation System has supply fans that provide makeup air that is filtered, heated by hot water coils for winter heating, and cooled by evaporative coolers for summer. Air is exhausted from the reactor buildings by exhaust fans located on the reactor building roof. The air from each zone is monitored before release. The Reactor Building Ventilation System also includes area cooling units for areas containing ECCS components.

The Containment System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	No	Yes (**F.2**)

The Containment System intended functions are:

- Provide primary containment boundary
- Provide vacuum relief system (vacuum breaker valves) to prevent drywell or suppression chamber (torus) negative pressure from damaging containment structure
- Provide air-operated reclosure of the inboard reactor building to torus vacuum breakers
- Provide pressure suppression by cooling/condensation of Safety Relief Valves (SRVs) steam from boiler drains and vents system and Reactor Core Isolation Cooling (RCIC) System and High Pressure Coolant Injection (HPCI) System turbine exhaust steam; accept HPCI and RCIC System pump minimum bypass flow
- Provide water supply to RCIC System, HPCI System, CS System, and/or RHR System pumps
- Provide forced air cooling for RHR System and CS System pump motors
- Provide secondary containment boundary (passive functions)
- Provide pressure boundary of Containment System components connected to control air system that must maintain pressure boundary in support of supplying CAD to the MSRVs (**F.2**)
- Fire dampers required for unit operation (**F.3**)

The portions of the primary containment system that contain components requiring an AMR includes the drywell, the suppression chamber, connecting and internal piping, penetrations, and associated isolation and pressure control features. The portions of the secondary containment system that contain components requiring an AMR include the reactor building structure and piping that penetrates the zonal boundaries and the exterior walls of the secondary containment. The portions of the reactor building ventilation system that contain components requiring an AMR include the fans, coolers, and associated ductwork for the RHR and the CS pump motor coolers.

UFSAR Reference

Additional details for the Containment System are found in UFSAR **5.2**, **5.3**, **7.3**, **7.8**, **C.5**, **12.2.2**, **F.6.21**, **F.7.1**, and **F.7.15**.

License Renewal Drawings

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

1-47E610-64-1-LR	**2-47E610-64-1-LR**	**3-47E610-64-1-LR**	**0-47E851-1-LR**
1-47E817-1-LR	**2-47E859-1-LR**	**3-47E817-1-LR**	**0-47E865-11-LR**
1-47E865-1-LR	**2-47E862-1-LR**	**3-47E859-1-LR**	**0-47E865-15-LR**
1-47E865-3-LR	**2-47E865-13-LR**	**3-47E862-1-LR**	
	2-47E2847-5-LR	**3-47E865-12-LR**	
	2-47E2847-9-LR	**3-47E3847-5-LR**	
	2-47E2865-12-LR	**3-47E3847-9-LR**	

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.1, Containment System.

The aging management review results for these components are provided in Table **3.2.2.1**, Containment System (064) – Summary of Aging Management Evaluation.

Table 2.3.2.1 Containment System

Component Types	Intended Functions
Bolting	MC, SS
Ductwork	PB
Heat Exchangers	HT, PB
Fire Dampers	FB
Flexible Connectors	PB
Fittings	PB
Piping	PB
Strainers	DP, PB
Traps	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.2.2 Standby Gas Treatment System (065)

System Description

The SGT System is a plant-shared system. The SGT System consists of a suction duct system, three filter trains and blowers, and a discharge vent system. The common suction duct system takes suction from the normal ventilation exhaust duct of each of the three reactor zones and from the refueling zone independent of the normal ventilation system. Each filter train contains a moisture separator, a heater, a prefilter, an upstream HEPA filter, a charcoal filter, and a downstream HEPA filter. The three filter trains and blowers are arranged in parallel. The three blowers share a common discharge header that discharges to the 600-foot high plant stack. The SGT System is normally in standby and starts automatically when required. The filter trains and blowers are located in the SGT Building.

The SGT System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	Yes	No	No

The SGT System intended functions are:

- Maintain negative pressure in secondary containment on Primary Containment System Group 6 isolation signal, filter airborne particulates and gases (including those from HPCI System and CAD System) prior to discharge to Off-Gas System
- Maintain negative pressure in secondary containment on Primary Containment System signal due to radiation monitoring system refueling zone high radiation signal; filter airborne particulates and gases prior to discharge to Off-Gas System

The portion of the SGT System that contain components requiring an AMR extends from the suction points within the reactor buildings through the filter trains and blowers to the plant stack.

UFSAR References

Additional detail for the SGT System is found in UFSAR **5.3.3**, **7.12.5**, and **F.7.18**.

License Renewal Drawings

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

1-47E865-1-LR
0-47E865-11-LR
0-47E830-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.2, Standby Gas Treatment System.

The aging management review results for these components are provided in Table **3.2.2.2**, Standby Gas Treatment System (065) - Summary of Aging Management Evaluation.

Table 2.3.2.2 Standby Gas Treatment System

Component Type	Intended Functions
Bolting	MC, SS
Ductwork	PB, SS
Fittings	PB
Flexible Connectors	PB
Piping	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.2.3 High Pressure Coolant Injection System (073)

System Description

The HPCI System:

- In conjunction with the other ECCS during design basis accidents, limits the peak fuel clad temperature over the complete spectrum of possible break sizes in the RCPB. The HPCI System provides adequate core cooling for small breaks and depressurizes the reactor coolant systems to allow low-pressure coolant injection and CS flow.
- Provides reactor vessel make-up, pressure control, and decay heat removal during regulated events.

The HPCI System for each unit shares no components with the other units except that each unit's HPCI pump may take suction from any unit's condensate storage tank. The HPCI System consists of a single steam turbine driven pump. The steam supply for the turbine comes from the MS System and exhausts to the suppression pool. The pump takes suction from the condensate storage tank or the suppression pool and discharges into the reactor vessel through the FW System. A full flow test line to the condensate storage tank is provided. The HPCI System is normally in standby. The HPCI System automatically starts on low water level in the reactor vessel or high pressure in the drywell.

The HPCI System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	No	Yes

The HPCI System intended functions are:

- Provide RCPB during HPCI System standby
- Provide RCPB during HPCI System operation
- Provide primary containment boundary during HPCI System standby
- Provide primary containment boundary during HPCI System operation
- Limit the loss of coolant through HPCI System steam supply line break (Passive, flow restrictor built into steam line)
- Provide secondary containment boundary
- Establish Main Steam Injection Valve (MSIV) leakage pathway to condenser (F.1)
- The HPCI System will provide coolant injection into the reactor vessel until it can be manually run in the CST-to-CST recirculation mode for pressure relief and decay heat

The portions of the HPCI System that contain components requiring an AMR extend: 1.) in the steam supply from the interconnection with the MS System through the turbine to the exhaust in the suppression pool and 2.) in the water circuit from the pump's suctions from the suppression pool and from the Condensate Storage Tank (interconnection with the CS system) through the pump to the reactor vessel injection (interconnection with the FW system) and test line to the condensate storage tank. Turbine auxiliary components in the lubricating oil and gland exhaust subsystems also require an AMR.

UFSAR References

Additional description of the HPCI System is contained in UFSAR **5.2.3**, **5.3**, **6.3**, **6.4.1**, and **7.4**.

License Renewal Drawings

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

1-47E812-1-LR	**2-47E812-1-LR**	**3-47E812-1-LR**
	2-47E812-2-LR	**3-47E812-2-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.3, High Pressure Coolant Injection System.

The aging management review results for these components are provided in Table **3.2.2.3**, High Pressure Coolant Injection System (073) – Summary of Aging Management Evaluation.

Table 2.3.2.3 High Pressure Coolant Injection System

Component Type	Intended Functions
Bolting	MC, SS
Condenser	PB
Expansion Joint	PB
Fittings	PB
Fittings - RCPB	FR, PB
Flexible Connectors	PB
Gland Seal Blower	PB
Heat Exchangers	HT, PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Restricting Orifice	FR, PB
Restricting Orifice - RCPB	FR, PB
Strainers	DP, PB

Component Type	Intended Functions
Tanks	PB
Traps	PB
Tubing	PB
Turbines	PB
Valves	FD, PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.2.4 Residual Heat Removal System (074)

System Description

The RHR System provides:

- Shutdown cooling (RHR with the reactor at low temperature) during normal operations and regulated events - The system circulates water from the recirculation pump suction through the RHR heat exchangers back to the recirculation pump discharge into the reactor vessel and through the core for decay heat removal when the Reactor Coolant systems are intact. This mode of operation is manually initiated when required.
- Core flooding to limit in conjunction with the other ECCS the peak fuel clad temperature over the complete spectrum of possible break sizes in the RCPB during design basis accidents - In the Low Pressure Coolant Injection mode, the system pumps water from the suppression pool into the reactor vessel through the recirculation pumps discharge line.
- Long term cooling following loss of coolant accidents - Following low-pressure coolant injection during a loss of coolant accident (LOCA), cooling is manually initiated using the Low Pressure Coolant Injection flowpath through the RHR heat exchanger.
- Primary containment pressure and temperature control - In containment spray mode, the system pumps water from the suppression pool to spray headers in the primary containment to condense steam and control pressure in the primary containment. This mode of operation is manually initiated when required following a LOCA. In suppression pool cooling mode, the system pumps water from the suppression pool through the heat exchangers back to the suppression pool. This mode of operation is manually initiated when required during both normal and accident conditions.
- Containment flooding post accident - Water can be pumped from non-accident unit suppression pools or from the RHR Service Water system (Standby Coolant Supply) to flood the containment. This mode of operation is manually initiated.
- Suppression pool level control - Provisions are provided for both makeup and reject to maintain the suppression pool level within required limits.
- Supplemental fuel pool cooling - Cross-connections with the Fuel Pool Cooling (FPC) System allow the RHR heat exchangers to supplement heat removal from the spent fuel pool and to provide a permanent source of makeup water for the spent fuel pool.

Each unit has two RHR System loops with each loop having two RHR pumps and two RHR heat exchangers. The pump suction header and heat exchanger discharge header of one loop in U1 and one loop in U2 can be cross-connected. A similar cross-connection is provided between U2 and U3.

The RHR System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	No	Yes

The RHR System intended functions are:

- Provide suppression pool water cooling to maintain suppression pool water temperature below limits to assure that pump NPSH requirements are met and that complete condensation of blowdown steam from a design basis LOCA can be expected
- Provide spray to drywell and torus for containment cooling and lowering of containment pressure under post-accident conditions
- Provide secondary containment boundary and pressure boundary interface with condensate (System 002) ring header
- Provide RCPB
- Provide primary containment boundary
- Provide RHR System piping flow path for transmission of condensate and demineralized water System water supply to HPCI System piping upstream of HPCI System pump
- Provide RHR System piping flow path from HPCI System pump minimum flow coolant to the main RHR System heat exchangers

Intergranular Stress Corrosion Cracking mitigation measures have been implemented (Section F.5).

The portion of the RHR System that contains components requiring an AMR, extends from its suction points (suction strainers in the suppression pool, interconnections with the Reactor Recirculation System, interconnections with the Condensate System, and the Fuel Pool Cooling and Cleanup System) through the pumps and heat exchangers, to its various discharge points (the torus and drywell spray headers, the suppression pool for cooling and test, the recirculation system for low pressure coolant injection and shutdown cooling, the fuel pool cooling and cleanup system for assisted cooling of the fuel pool, and the capped reactor vessel head spray line (Section F.8). The components associated with the Drain pumps, PSC Head Tank Lines, and the Condensate Storage and Supply System lines also require an AMR.

UFSAR References

Additional detail for the RHR System is found in UFSAR **3.3**, **4.1**, **4.8**, **5.2.3**, **5.3**, **6.4.4**, **7.3**, **7.4**, **7.18**, **9.2**, **10.5**, **10.9**, **10.10**, **10.17**, **F.7.9**, **F.7.15**, and **F.7.16**.

License Renewal Drawings

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

1-47E811-1-LR **2-47E811-1-LR** **3-47E811-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.4, Residual Heat Removal System.

The aging management review results for these components are provided in Table **3.2.2.4**, Residual Heat Removal System (074) – Summary of Aging Management Evaluation.

Table 2.3.2.4 Residual Heat Removal System

Component Type	Intended Function
Bolting	MC, SS
Fittings	FD, FR, PB
Fittings - RCPB	PB
Heat Exchangers	HT, PB
Piping - RCPB	PB
Piping	PB
Pumps	PB
Restricting Orifice	FR, PB
Strainers	DP, PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.2.5 Core Spray System (075)

System Description

The CS System provides spray cooling of the reactor core to limit, in conjunction with the other ECCS, the peak fuel clad temperature over the complete spectrum of possible break sizes in the RCPB during design basis accidents.

A separate CS System is provided for each unit. The CS System for each unit has two independent loops. Each loop has two pumps that can pump water from the suppression pool directing into the reactor vessel to spray headers located above the core within the core shroud. CS System components within the reactor vessel are evaluated in Section **2.3.1.2,** Reactor Vessel Internals. Full flow pump test capability is provided by discharge lines back to the suppression pool. The CS System is normally in standby and starts automatically when required. Full flow suction lines from the Condensate Storage Tanks penetrate the secondary containment and provide a suction flow path for the RCIC and HPCI systems.

The CS System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	Yes (**F.4**)	No	No

The CS System intended functions are:

- Supply cooling water to reactor - auto initiation
- Provide RCPB
- Provide primary containment boundary
- Provide secondary containment boundary and pressure boundary interface with condensate (System 002) ring header

Intergranular Stress Corrosion Cracking mitigation measures have been implemented (Section **F.5**).

The portions of the CS System that contain components requiring an AMR extend from the suction points in the suppression pool and the Condensate Storage and Supply System to the reactor vessel nozzles. The CS pump test lines to the Suppression Pool and lines associated with PSC Head Tank, Drain Pumps, and the Condensate Storage and Supply System also contain components requiring an AMR.

UFSAR References

Additional detail for the CS System is found in UFSAR **4.4**, **5.2**, **5.3**, **6.4.3**, **7.3**, **7.4**, **7.8**, **10.10**, and **11.7**.

License Renewal Drawings

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

1-47E814-1-LR **2-47E814-1-LR** **3-47E814-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.5, Core Spray System.

The aging management review results for these components are provided in Table **3.2.2.5**, Core Spray System (075) – Summary of Aging Management Evaluation.

Table 2.3.2.5 Core Spray System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	FR, PB
Fittings - RCPB	PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Restricting Orifice	FR, PB
Restricting Orifice - RCPB	FR, PB
Strainers	DP, PB
Tanks	PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.2.6 Containment Inerting System (076)

System Description

The Containment Inerting System provides the capability to measure oxygen and hydrogen concentrations in the primary containment after an accident. A separate oxygen and hydrogen monitoring system with two sampling loops is provided for each unit. The loops have pumps that pump the drywell or torus atmosphere past hydrogen and oxygen sensors back to the torus. The system is started manually post-accident.

The Containment Inerting System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	Yes (**F.4**)	No	No

The Containment Inerting System intended functions are:

- Provide oxygen and hydrogen gas analyzers and indicators to monitor gas concentrations inside the primary containment in support of Containment Atmosphere Dilution (CAD) System operation
- Provide primary containment boundary
- Provide secondary containment boundary

The portion of the Containment Inerting System that contains components requiring an AMR extends from the primary containment sample points through the sample cabinet back to the torus through the sample return line. Cooling water lines and components in the sample cabinet also require an AMR.

UFSAR References

Additional detail for the Containment Inerting System is found in UFSAR **5.2.6**.

License Renewal Drawings

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

1-47E1610-76-3-LR	**2-47E610-76-4-LR**	**3-47E610-76-4-LR**
1-47E860-1-LR	**2-47E860-1-LR**	**3-47E860-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.6, Containment Inerting System.

The aging management review results for these components are provided in Table **3.2.2.6**, Containment Inerting (076) – Summary of Aging Management Evaluation.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 2.3.2.6 Containment Inerting System

Component Type	Intended Functions
Bolting	MC, SS
Flexible Connectors	PB
Heat Exchangers	PB
Fittings	PB
Piping	PB
Pumps	PB
Strainers	DP, PB
Traps	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.2.7 Containment Atmosphere Dilution System (084)

System Description

The CAD System is a plant-shared system. The CAD System consists of two trains, each of which is capable of supplying nitrogen through separate piping systems to the drywell and suppression chamber. Each train has a liquid nitrogen supply tank, an ambient vaporizer, and an electric heater. The nitrogen storage tanks have a total volume of 4000 gallons each. The system is normally in standby and is started manually when required.

The CAD System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes (F.3)	Yes (F.4)	No	Yes (F.2)

The CAD System intended functions are:

- Provide dilution of the primary containment atmosphere with nitrogen after a LOCA to maintain gas concentrations (oxygen and hydrogen) below level (5% oxygen by volume) which could produce a combustible gas mixture
- Provide primary containment boundary
- Provide secondary containment boundary
- Provide nitrogen as the actuating medium for the reactor building to torus vacuum breaker butterfly valves when control air is not available
- Provide nitrogen makeup to the MSRVs (F.2)

The portion of the CAD System that contains components requiring an AMR extends from the liquid nitrogen supply tanks to the drywell and suppression chamber and to interconnections with the control air system.

UFSAR References

Additional detail for the CAD System is found in UFSAR 5.2.3 and 5.2.6

License Renewal Drawings

The license renewal drawings for the CAD System are:

1-47E862-1-LR 2-47E862-1-LR 3-47E862-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.2.7, Containment Atmosphere Dilution System.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

The aging management review results for these components are provided in Table **3.2.2.7**, Containment Atmosphere Dilution (084) – Summary of Aging Management Evaluation.

Table 2.3.2.7 Containment Atmosphere Dilution System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Flex Hose	PB
Heat Exchangers	HT, PB
Piping	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3 Auxiliary Systems

The Auxiliary Systems function to support normal and emergency plant operations. The systems provide cooling, ventilation, sampling and other required functions. The following systems are included in this subsection:

Section	System Number	System Name
2.3.3.1	012	Auxiliary Boiler
2.3.3.2	018	Fuel Oil
2.3.3.3	023	Residual Heat Removal Service Water
2.3.3.4	024	Raw Cooling Water
2.3.3.5	025	Raw Service Water
2.3.3.6	026	High Pressure Fire Protection
2.3.3.7	029	Potable Water
2.3.3.8	030	Ventilation
2.3.3.9	031	Heating, Ventilation, and Air Conditioning
2.3.3.10	032	Control Air
2.3.3.11	033	Service Air
2.3.3.12	039	CO_2
2.3.3.13	040	Station Drainage
2.3.3.14	043	Sampling and Water Quality
2.3.3.15	044	Building Heat
2.3.3.16	050	Raw Water Chemical Treatment
2.3.3.17	053	Demineralizer Backwash Air
2.3.3.18	063	Standby Liquid Control
2.3.3.19	066	Off-Gas
2.3.3.20	067	Emergency Equipment Cooling Water
2.3.3.21	069	Reactor Water Cleanup
2.3.3.22	070	Reactor Building Closed Cooling Water
2.3.3.23	071	Reactor Core Isolation Cooling
2.3.3.24	072	Auxiliary Decay Heat Removal

Section	System Number	System Name
2.3.3.25	077	Radioactive Waste Treatment
2.3.3.26	078	Fuel Pool Cooling and Cleanup
2.3.3.27	079	Fuel Handling and Storage
2.3.3.28	082	Diesel Generator
2.3.3.29	085	Control Rod Drive
2.3.3.30	086	Diesel Generator Starting Air
2.3.3.31	090	Radiation Monitoring
2.3.3.32	092	Neutron Monitoring
2.3.3.33	094	Traversing In-Core Probe
2.3.3.34	111	Cranes

2.3.3.1 Auxiliary Boiler System (012)

System Description

The Auxiliary Boiler System provides heating and miscellaneous steam services within the power house, including the ability to test the HPCI and the RCIC Systems turbines while the reactor is shutdown. The Auxiliary Boiler System is a plant-shared system. There are three oil-fired auxiliary boilers located in the turbine building.

The Auxiliary Boiler System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Auxiliary Boiler System intended functions are:

- Provide secondary containment boundary
- Provide primary containment boundary
- Establish MSIV leakage pathway to condenser (**F.1**)

The portions of the Auxiliary Boiler System that contain components that require an AMR are piping, valves, and strainers that form part of the secondary containment boundary and also includes abandoned primary containment penetrations and drain lines connecting to the CS System, the HPCI System, and RCIC System.

UFSAR References

Additional detail for the Auxiliary Boiler System is found in UFSAR **5.2**, **5.3**, and **10.20**,

License Renewal Drawings

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

1-47E815-3-LR **2-47E815-4-LR** **3-47E815-5-LR** **0-47E815-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.1, Auxiliary Boiler System.

The aging management review results for these component types are provided in Table **3.3.2.1**, Auxiliary Boiler System (012) – Summary of Aging Management Evaluation.

Table 2.3.3.1 Auxiliary Boiler System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Traps	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.2 Fuel Oil System (018)

System Description

The Fuel Oil System is a plant-shared system. Two large storage tanks are provided for the plant. Pumps allow transfer of fuel oil to the auxiliary boilers and storage tanks for the various diesel engines. The Standby AC Power Fuel Oil System consists of three interconnected storage tanks for each of the system's eight diesel generators (DG) that provide sufficient fuel for seven days of post-LOCA operation. Transfer pumps are provided to transfer fuel from the 7-day storage tanks to their associated DG day tank. Each diesel has a day tank and pumps that supply the fuel injectors. The system is normally in standby and starts automatically when required to supply fuel to an operating DG. The other plant diesels each have a single storage tank and components needed to transfer fuel oil from the tank to its associated diesel injectors.

The Fuel Oil System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	No	No	Yes

The Fuel Oil System intended functions are:

- Provide diesel fuel oil to DG system
- Maintain 7 day (long term) supply of fuel oil in storage tanks in support of DG System

The portions of the Fuel Oil System that contain components subject to an AMR extend from the 7-day storage tanks to the fuel injectors for the Standby AC Power System DGs and from the storage tanks to the fuel injectors for the diesel driven fire pump. The Fuel Oil System transfer piping and components in each DG building are subject to an AMR.

UFSAR References

Additional detail for the Fuel Oil System is found in UFSAR **8.5.3.4**.

License Renewal Drawings

The license renewal drawings for the Fuel Oil System are listed below:

0-47E840-2-LR
0-47E840-3-LR

Components Subject to an AMR

The component types that require aging management review are indicated in Table 2.3.3.2, Fuel Oil System.

The aging management review results for these component types are provided in Table **3.3.2.2**, Fuel Oil System (018) – Summary of Aging Management Evaluation.

Table 2.3.3.2 Fuel Oil System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	DP, PB
Flex Hose	PB
Piping	PB
Pumps	PB
Restricting Orifice	FR, PB
Strainers	DP, PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.3 Residual Heat Removal Service Water System (023)

System Description

The RHRSW System is a plant-shared system. The RHRSW System pumps water from Wheeler Reservoir through the RHR heat exchangers and Emergency Equipment Cooling Water (EECW) System components and discharges back to Wheeler Reservoir. The RHRSW System is a twelve-pump system with four pairs of pumps normally assigned to the RHR System and two pairs of pumps normally assigned to the EECW System. Each of the pairs assigned to the RHR System feeds one RHRSW header that, in turn, cools the heat exchangers in one RHR System loop in each unit's reactor building. Each of the pairs assigned to the EECW System feeds one of the two EECW headers in each unit's reactor building. The pumps are located in the Intake Pumping Station.

The RHRSW System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes	No	Yes

The RHRSW System intended functions are:

- Provide cooling water to RHR System heat exchangers
- Provide cooling water to EECW System upon start of the RHRSW pumps given EECW valve position interlock signals
- Provide secondary containment boundary
- Provide sump pump capability for RHRSW pump compartments

The portions of the RHRSW System that contain components subject to an AMR extend from the pumps at Intake Pumping Station, through supply piping to heat exchangers for the RHR System and EECW System, and then through the discharge piping.

UFSAR References

Additional detail for the RHRSW System is found in UFSAR **4.8**, **5.3**, **7.12.4**, **7.18**, **10.9**, **10.10**, **11.6**, **F.7.7**, **F.7.15**, and **F.7.16**.

License Renewal Drawings

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

1-47E858-1-LR **2-47E858-1-LR** **3-47E858-1-LR** **0-47E851-4-LR**
1-47E811-1-LR **2-47E811-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.3, Residual Heat Removal Service Water System.

The aging management review results for these components are provided in Table **3.3.2.3**, Residual Heat Removal Service Water System (023) – Summary of Aging Management Evaluation.

Table 2.3.3.3 Residual Heat Removal Service Water System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Pumps	PB
Restricting Orifice	FR, PB
Strainers	DP
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.4 Raw Cooling Water System (024)

System Description

The Raw Cooling Water (RCW) System cools plant components (including components in the Reactor Building) during normal operations. Unit 1 and Unit 2 RCW Systems share pump suction and discharge headers and seven RCW pumps. The separate Unit 3 RCW System has five pumps that has a separate suction header but shares the discharge header with Units 1 and 2. Three pumps per unit are normally required. The RCW System has interfaces with the EECW System (Section **2.3.3.20**). The system is normally in service. The RCW pumps are located in the turbine building and are supplied from the Condenser Circulating Water System.

The RCW System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The RCW System intended functions are:

- Provide secondary containment boundary
- Provide pressure boundary integrity to EECW System
- Provide flow path through control room chillers A and B for Units 1 and 2

The portions of the RCW System that contain components requiring an AMR are the components that form the secondary containment boundary and includes the liquid filled piping within the reactor building. Also included are the components that interconnect with the EECW System.

UFSAR References

Additional detail for the RCW System is found in UFSAR **5.3**, **10.7**, and **F.6.5**.

License Renewal Drawings

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

1-47E822-1-LR	**2-47E822-1-LR**	**3-47E822-1-LR**
1-47E844-2-LR	**2-47E844-2-LR**	**3-47E844-2-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.4, Raw Cooling Water System.

The aging management review results for these component types are provided in Table **3.3.2.4**, Raw Cooling Water System (024) – Summary of Aging Management Evaluation.

Table 2.3.3.4 Raw Cooling Water System

Component Type	Intended Functions
Bolting	MC, SS
Expansion Joint	PB
Fittings	FR, PB
Flex Hose	PB
Piping	FR, PB
Pumps	PB
Strainers	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.5 Raw Service Water System (025)

System Description

The Raw Service Water (RSW) System furnishes water for yard-watering, cooling for miscellaneous plant equipment that requires small quantities of cooling water, and functions as a keep-fill system for the fire protection system. The RSW System is supplied river water from the condenser circulating water inlet conduit through a strainer to the main RCW pump suction header for each unit. Unit 1 and Unit 2 each have one RSW pump and Unit 3 has two RSW pumps. Therefore, four pumps supply the common plant system. Two 10,000-gallon capacity storage tanks are located atop the reactor building. These tanks pressurize High Pressure Fire Protection (HPFP) System header.

The RSW System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	No

The RSW System Licensing Renewal function is:

- Provide secondary containment boundary
- Provide keep-fill system for the Fire Protection System

The portion of the RSW System that contains components requiring an AMR extends from the tanks through the secondary containment to interconnections with the HPFP System.

UFSAR References

Additional detail for the RSW System is found in UFSAR **5.3**, **10.8**, **10.10**, and **F.6.6**.

License Renewal Drawings

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

1-47E836-1-LR
1-47E850-1-LR
1-47E850-2-LR
2-47E850-1-LR
2-47E850-2-LR
3-47E850-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.5, Raw Service Water System.

The aging management review results for these component types are provided in Table **3.3.2.5**, Raw Service Water System (025) Summary of Aging Management Evaluation.

Table 2.3.3.5 Raw Service Water System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.6 High Pressure Fire Protection System (026)

System Description

The HPFP System supplies water for fixed water spray, pre-action sprinkler, and aqueous foam systems for selected equipment and areas in the control building, the reactor buildings, the turbine building, the intake pumping station, hydrogen trailer port, the transformer yard, DG buildings, and service buildings.

The HPFP System is a plant-shared system. The system is supplied water by three motor-driven pumps at the Intake Pumping Station and a single diesel driven pump located in a building adjacent to gate structure 2 on the cold water channel. The pumps discharge into a common header for distribution throughout the plant to hydrants, hose racks, hose connections, and water spray systems. Included in the HPFP System are detection and alarm devices that automatically initiate the system or prompt manual fire firefighting activities using the system.

The HPFP System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	No	No	No

The HPFP System intended functions are:

- Support secondary containment function
- Provide automatic fire protection for known hazardous areas where it is practical to do so
- Provide adequate warning of fire in hazardous areas where automatic protection is not feasible to provide adequate manually-actuated fire protection systems for the entire plant and yard areas (i.e., hose stations, hydrants, etc.)
- Ensure the maintenance of divisional integrity of safety-related systems to the extent that the capability for safe shutdown of the reactors is assured during and after a fire

The portion of the HPFP System that contains components requiring an AMR extends the suctions of the fire pumps to the suppression end devices (e.g., sprinklers) in in-scope buildings and for outside in-scope components. For out-of scope buildings (e.g., office buildings), the in-scope portion extends from system main header to a building branch header isolation valve.

UFSAR References

Additional detail for the HPFP System is found in the UFSAR **10.11** and **F.6.9**.

License Renewal Drawings

The license renewal drawings for the HPFP System are:

1-47E836-1-LR
1-47E850-1-LR
1-47E850-2-LR
1-47E850-3-LR
1-47E850-5-LR
1-47E850-6-LR
1-47E850-8-LR
1-47E850-9-LR
2-47E2865-4-LR
2-47E836-1-LR
2-47E850-10-LR
2-47E850-1-LR
2-47E850-2-LR
2-47E850-3-LR
2-47E850-5-LR
2-47E850-6-LR
3-47E836-1-LR
3-47E850-10-LR
3-47E850-1-LR
3-47E850-2-LR
3-47E850-3-LR
3-47E850-4-LR
3-47E850-5-LR
3-47E850-7-LR
3-47E850-8-LR
3-47E850-9-LR
0-47E836-2-LR
0-47E850-4-LR
0-47E850-12-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.6, High Pressure Fire Protection System.

The aging management review results for these components are provided in Table **3.3.2.6**, High Pressure Fire Protection System (026) – Summary of Aging Management Evaluation.

Table 2.3.3.6 High Pressure Fire Protection System

Component Type	Intended Functions
Bolting	MC, SS
Fan (Housing)	PB
Fire Hydrants	PB
Fire Hose Stations	PB, SS
Fittings	PB
Flexible Connectors	PB
Heaters	PB
Heat Exchangers	PB
Piping	PB
Pumps	PB
Restricting Orifice	PB
Silencer	PB
Sprinkler Heads	PB, SPR
Strainers	DP, PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.7 Potable Water System (029)

System Description

Potable water for use in the plumbing systems is supplied by the city of Athens, Alabama. Backflow preventers are installed at each cross connection to other systems to protect the potable water supply from possible contamination due to backflow. The Potable Water System is a plant-shared system and is supplied to various areas in the plant.

The Potable Water System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Potable Water System Licensing Renewal function is:

- Provide secondary containment boundary

The portions of the Potable Water System that contain components that require an AMR extend from check valves outside the secondary containment to components using or supplying potable water in the reactor building and the control bay. Also piping that interfaces with the hot water and chilled water lines in the Air Conditioning System require an AMR.

UFSAR References

Additional detail for the Potable Water System is found in UFSAR **5.3**, **10.15**, and **F.6.11**.

License Renewal Drawings

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

3-47E866-7-LR **0-47E835-1-LR**
0-47E866-3-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.7, Potable Water System.

The aging management review results for these component types are provided in Table **3.3.2.7**, Potable Water System (029) – Summary of Aging Management Evaluation.

Table 2.3.3.7 Potable Water System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.8 Ventilation System (030)

System Description

The Ventilation System has subsystems to provide ventilation and heating for various plant buildings including the radioactive waste building and the DG buildings. The Ventilation System is a plant-shared system. The Ventilation Systems do not include the Heating, Ventilation, and Air Conditioning (HVAC) Systems (Section **2.3.3.9**) or the Reactor Building Ventilation Systems (Section **2.3.2.1**).

The Radioactive Waste Building Ventilation System consists of two 50-percent capacity supply fans filtered air to central areas on the various floor levels. Two 50-percent capacity exhaust fans exhaust air from individual spaces in the radioactive waste building through roughing and HEPA filters. The discharge ducts pass through the reactor buildings before discharging the air on the reactor building roof. The air is monitored before release.

The Ventilation Systems for the DG buildings are designed to maintain the required environmental conditions for safety-related equipment located in the Units 1, 2, and 3 DG buildings. Each non-air conditioned room has an exhaust fan that draws outside air through the room.

The Ventilation Systems are in the scope of 10 CFR 54 because they contain components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The Ventilation Systems intended functions are:

- Provide ventilation to the Unit 1 and 2 DG building
- Provide ventilation to the Unit 3 DG building
- Provide ventilation to 250V Battery Room 3EB in the Unit 3 DG building to prevent buildup of hydrogen gas during battery charging
- Provide secondary containment integrity (passive)

The portions of the Ventilation System that contain components requiring an AMR include the DG ventilation system and the portion of the radioactive waste building ventilation system that passes through the reactor building.

UFSAR References

Additional detail for the Ventilation System is found in UFSAR **5.3**, **10.12**, and **F.7.11**.

License Renewal Drawings

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

3-47E865-8-LR **0-47E865-6-LR**
0-47E865-8-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.8, Ventilation System.

The aging management review results for these component types are provided in Table **3.3.2.8**, Ventilation System (030) – Summary of Aging Management Evaluation.

Table 2.3.3.8 Ventilation System

Component Type	Intended Functions
Bolting	MC, SS
Ductwork	DP, PB, SS
Fire Dampers	FB, SS
Fittings	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.9 Heating, Ventilation, and Air Conditioning System (031)

System Description

The HVAC subsystems provide air-conditioned ventilation for various plant areas. The HVAC Systems provide:

- Environmental control of the control bay so that personnel occupancy can be maintained in the control room during any type of accident, including events that produce radioactive and toxic gas hazards.
- Ventilation and cooling so that the temperatures of the control bay and shutdown electrical board rooms (including those in the Unit 3 DG Building) are maintained within acceptable limits for the operation of instruments and other equipment during accidents and events.
- Battery room ventilation to prevent the buildup of explosive gases.
- Cooling of various electrical equipment rooms, e.g., computer and communications so that the temperature is maintained within acceptable limits for the operation of instruments and other equipment when required.

The normal control bay heating and ventilation system serves three floors in the control bay and six shutdown electrical board rooms located in the reactor building. There are eight general areas served: 1.) Unit 1 and Unit 2 control room, 2.) Units 1 and 2 elevation 593, 3.) relay room, 4.) Unit 3 control room, 5.) Unit 3 elevation 593, 6.) Unit 1 electrical board rooms, 7.) Unit 2 electrical board rooms, and 8.) Unit 3 electrical board rooms. The system for each of the eight general areas is equipped with two 100% capacity units. During normal operation, outside air is drawn into the control room. During accident conditions, the control room is pressurized and the pressurizing outside air is filtered by the auto start of the Control Room Emergency Ventilation System (CREVS). The CREVS is a plant-shared system. The CREVS has dual trains. Each train has a fan, a post filter, and a charcoal filter. A single HEPA filter is shared by both trains.

The HVAC Systems are in the scope of 10 CFR 54 because they contain components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	Yes	No	Yes

The Heating, Ventilation, and Air Conditioning System intended functions are:

- Isolate supply ducts and supply pressurized filtered outdoor air to main control room on Primary Containment Isolation System Group 6 signal or Radiation Monitoring System initiation signal
- Provide ventilation to cable spreading rooms and control bay mechanical equipment rooms
- Recirculate cool air to the reactor building board rooms

- Provide ventilation and air conditioning to Unit 3 DG buildings board rooms
- Provide recirculation air conditioning to control rooms and auxiliary instrument rooms
- Provide ventilation to battery rooms
- Provide manual lineup of HVAC equipment with total loss of control air
- Provide secondary containment boundary

The portion of the HVAC System that contains components requiring an AMR includes the entire Control Room Emergency Ventilation subsystem including isolation devices from the normal ventilation systems. For ventilation systems for electrical equipment rooms, the portions of the ventilation sub-systems that contain ductwork components requiring an AMR, includes the entire system for rooms (e.g., battery rooms) containing in-scope equipments and the system up to and including isolation devices for rooms (e.g., process computer room) containing out-of scope equipment in the reactor buildings, the control bays, and the Unit 3 DG Building. The portions of the liquid-filled chilled water and chilling piping sub-systems that contain components requiring an AMR include all portions that are required for cooling of in-scope components (including the Unit 2 shutdown board rooms in the Unit 3 DG Building) and include piping systems within the reactor buildings and control bay rooms containing in-scope equipment.

UFSAR References

Additional detail for the HVAC Systems is found in UFSAR **10.12**, and **F.7.11**.

License Renewal Drawings

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

1-47E1865-4-LR	**2-47E2865-4-LR**	**3-47E3865-4-LR**	**0-47E865-15-LR**
1-47E859-1-LR	**2-47E859-1-LR**	**3-47E859-2-LR**	**0-47E865-2-LR**
		3-47E865-4-LR	**0-47E865-4-LR**
		3-47E865-8-LR	**0-47E866-3-LR**
		3-47E866-5-LR	**0-47E866-9-LR**
		3-47E866-7-LR	
		3-47E859-1-LR	

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.9, Heating, Ventilation, and Air Conditioning System.

The aging management review results for these component types are provided in Table **3.3.2.9**, Heating, Ventilation, and Air Conditioning System (031) – Summary of Aging Management Evaluation.

Table 2.3.3.9 Heating, Ventilation, and Air Conditioning System

Component Type	Intended Functions
Bolting	MC, SS
Ductwork	DP, FB, PB, SS
Fire Dampers	PB, SS, FB
Fittings	PB
Flexible Connectors	PB
Heat Exchangers	HT, PB
Heaters	PB
Piping	PB
Pumps	PB
Refrigerant Compressor	PB
Strainers	DP, PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.10 Control Air System (032)

System Description

The Control Air System provides:

- Motive power for numerous plant components during normal operations
- Post-accident motive power to the MS isolation valves and the MSRVs for reactor vessel overpressure relief protection, and reactor vessel depressurization including the ECCS automatic depressurization function
- Post-accident motive power to torus vacuum breaker valves

Each unit has a separate compressed nitrogen system for its primary containment. The primary containment system for each unit consists of two 9.4 scfm compressors that take suction from the primary containment atmosphere and supply components in the primary containment. The Primary Containment System normally operates and isolates post accident. Post accident and post event motive force for primary containment components is provided by accumulators and, long term, by manually initiated interconnections with the CAD System or bottled nitrogen.

A separate subsystem is a plant-shared system Control Air System that utilizes compressed air. The Control Air System has four 610 scfm and one 1445 scfm air compressors that are connected to a common discharge header. The common discharge header supplies an air dryer in each unit that then discharges into a unit header that supplies all unit loads. Valving allows each unit header to be connected to the adjacent unit's header. The system is normally operating. Essential components that are actuated by this portion of the control air will fail to their required post accident system upon loss of the system. In some cases (such as the outboard MS isolation valves), an accumulator is provided to boost the accident actuation.

The Control Air System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	No	Yes (F.2)

The Control Air System intended functions are:

- Perform isolation action(s) upon receiving primary containment system (64D) Group 6 isolation signals
- Provide compressed air to MS System ADS safety relief valves
- Provide compressed air for closure of MS isolation valves
- Provide compressed air to equipment access air lock seals to provide secondary containment boundary
- Provide primary containment boundary

- Provide/support secondary containment boundary
- Provide flow path integrity for supply of CAD nitrogen to the torus vacuum breaker valves
- Provide flow path for the CAD System to provide nitrogen to MSRVs (**F.2**)

The portions of the Control Air System drywell compressed air subsystem that contain components that require an AMR extend from interconnections with the CAD System through the primary containment to actuating devices on essential components such as the MSRVs. All piping headers inside the primary containment require an AMR (**F.2**). The drywell air compressor suction from the primary containment to the outboard primary containment isolation valves requires an AMR.

The portions of the remainder of the Control Air System that contain components that require an AMR extend from accumulators to actuating devices for essential components (such as the outboard MS isolation valves) or sealing components (such as on the reactor building equipment access lock seals). Piping and associated components that form the secondary containment boundary also require an AMR.

UFSAR References

Additional detail for the Control Air System is found in UFSAR **5.2.3**, **5.3**, **10.14**, and **F.6.3**.

License Renewal Drawings

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

1-47E1847-2-LR	**2-47E2847-1-LR**	**3-47E3847-1-LR**
1-47E1847-4-LR	**2-47E2847-4-LR**	**3-47E3847-2-LR**
1-47E1847-6-LR	**2-47E2847-5-LR**	**3-47E3847-5-LR**
1-47E1847-9-LR	**2-47E2847-7-LR**	**3-47E3847-7-LR**
1-47E1847-10-LR	**2-47E2847-9-LR**	**3-47E3847-9-LR**
1-47E610-32-2-LR	**2-47E610-32-2-LR**	**3-47E610-32-2-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.10, Control Air System.

The aging management review results for these component types are provided in Table **3.3.2.10**, Control Air System (032) – Summary of Aging Management Evaluation.

Table 2.3.3.10 Control Air System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Flexible Connectors	PB
Heat Exchangers	PB
Piping	PB
Restricting Orifice	FR, PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.11 Service Air System (033)

System Description

The Service Air System provides pressurized air to:

- Hose connections throughout the plant and yard
- Miscellaneous equipment in the SLC System, Amertap Condenser Tube Cleaning System (subsystem of the Condenser Circulating Water System), Condensate Demineralizer Air Surge System, and the Radwaste System

The Service Air System is a plant-shared system. The Service Air System consists of two air compressors located in the turbine building and associated piping that extends throughout the plant including into the reactor buildings. A capped primary containment penetration exists for service air to the drywell (Section **F.10**).

The Service Air System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Service Air System intended functions are:

- Provide primary containment boundary
- Provide secondary containment boundary

The portions of the Service Air System that contain components subject to an AMR are the piping and valves that provide the primary and secondary containment boundary.

UFSAR References

Additional details for the Service Air System are found in UFSAR **5.2.3**, **5.3**, **10.14**, and **F.6.3**.

License Renewal Drawings

The license renewal drawing for the Service Air System is listed below:

0-47E845-2-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.11, Service Air System.

The aging management review results for these components are provided in Table **3.3.2.11**, Service Air System (033) – Summary of Aging Management Evaluation.

Table 2.3.3.11 Service Air System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.12 CO_2 System (039)

System Description

The CO_2 System is a fire suppression system for the DG buildings, turbine building, and control bay spaces that contain electrical, lubricating oil, or fuel oil components. Units 1 and 2 share a system that includes a 17 ton storage tank. Unit 3 has a separate system with a 6 ton tank. The system is normally in standby and initiates automatically when required. When initiated, ventilation systems that could reduce the effectiveness of the CO_2 discharge are isolated. Detection and alarm devices that automatically initiate the system or would prompt manual fire firefighting activities are included in the CO_2 System.

The CO_2 System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	No	Yes	No	No	No

The CO_2 System intended function is:

- Provide CO_2 Fire Protection for oil and electrical hazards affecting the minimum SSDS components required to achieve safe shutdown capability

The portions of the CO_2 System that contain components that require an AMR extend from the storage tanks to the discharge points in the DG buildings, turbine buildings, and control bays.

UFSAR References

Additional detail for the CO_2 System is found in the UFSAR **10.11** and **F.6.9**.

License Renewal Drawings

The license renewal drawings for the CO_2 System are listed below:

3-47E843-2-LR **0-47E843-1-LR**
3-47E865-4-LR **0-47E865-4-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.12, CO_2 System.

The aging management review results for these component types are provided in Table **3.3.2.12**, CO_2 System (039) – Summary of Aging Management Evaluation.

Table 2.3.3.12 CO_2 System

Component Type	Intended Functions
Bolting	MC, SS
Ductwork	PB, SS
Fire Dampers	FB, SS
Fittings	PB
Piping	PB
Rupture Disk	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.13 Station Drainage System (040)

System Description

The Station Drainage System is a plant-shared system. The Station Drainage System collects, processes, stores, and disposes of non-radioactive liquid waste. Portions of the Station Drainage System piping penetrate secondary containment.

The Station Drainage System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Station Drainage System intended functions are:

- Provide secondary containment boundary

The portion of the Station Drainage System that contains components requiring an AMR extends from reactor building roof drains through the reactor building. It also includes drainage features for the DG buildings.

UFSAR References

Additional detail for the Station Drainage System is found in UFSAR **5.3** and **10.16**.

License Renewal Drawings

The license renewal drawings for the Station Drainage System are listed below:

0-47E851-1-LR
0-47E851-4-LR
0-47E852-3-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.13, Station Drainage System.

The aging management review results for these components are provided in Table **3.3.2.13**, Station Drainage System (040) – Summary of Aging Management Evaluation.

Table 2.3.3.13 Station Drainage System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Piping	PB
Valves	PB

Note: Additional information concerning component types is located in section 2.3.5.

2.3.3.14 Sampling and Water Quality System (043)

System Description

The Sampling and Water Quality System provides the capability to obtain representative samples for testing to obtain data. The data is used to evaluate the performance of the plant, equipment, and systems during normal plant operations. Water samples can be obtained from the Reactor Water Cleanup, MS, Condensate, Feedwater, Radwaste, FPC, Reactor Building Closed Cooling Water, RHRSW, and various auxiliary systems. Gas samples can be obtained from steam jet air ejectors, the Off-Gas System, and the main stack.

Using a post accident sample subsystem, representative samples of reactor coolant, torus liquid, drywell atmosphere, torus atmosphere, and secondary containment atmosphere can be obtained after a LOCA to guide post-LOCA actions on Units 2 and 3.

Portions of the system are credited in analyses for MS isolation valve alternate leakage treatment (Section **F.1**).

The Sampling and Water Quality System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	No	Yes (**F.2**)

The Sampling and Water Quality System intended functions are:

- Provide RCPB
- Provide primary containment boundary
- Maintain RHRSW System pressure boundary integrity
- Provide secondary containment boundary
- Provide pressure boundary of the Sampling and Water Quality System components connected to the control air system that must maintain pressure boundary in support of supplying CAD to the MSRVs (**F.2**)
- Establish MSIV leakage pathway to condenser (**F.1**)

For normally operating sample functions, the portions of the Sampling and Water Quality system that contain components requiring an AMR extend from its interfaces with sampled systems in the reactor building (Reactor Water Cleanup, RHR, RHRSW, and Primary Containment) to the secondary containment penetrations or drain lines in the reactor building.

For the post accident sampling functions, the portions of Sampling and Water Quality System that contain components requiring an AMR extend from its interfaces with sampled system to outboard isolation valves.

UFSAR References

Additional detail for the Sampling and Water Quality System is found in UFSAR **5.2.3**, **5.3**, **10.17**, and **10.21**.

License Renewal Drawings

The license renewal drawings for the Sampling and Water Quality System are:

0-105E3156-1	**2-47E610-43-1-LR**	**3-47E610-43-1-LR**
1-47E610-43-1-LR	**2-47E610-43-2-LR**	**3-47E610-43-2-LR**
1-47E610-43-2-LR	**2-47E811-1-LR**	**3-47E610-43-6-LR**
1-47E822-1-LR	**2-47E817-1-LR**	**3-47E811-1-LR**
1-47E844-2-LR	**2-47E822-1-LR**	**3-47E817-1-LR**
1-47E817-1-LR	**2-47E844-2-LR**	**3-47E856-2-LR**
	2-47E856-2-LR	**3-47E867-3-LR**
	2-47E860-1-LR	**3-47E860-1-LR**
	2-47E867-3-LR	

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.14, Sampling and Water Quality System.

The aging management review results for these component types are provided in Table **3.3.2.14**, Sampling and Water Quality System (043) – Summary of Aging Management Evaluation.

Table 2.3.3.14 Sampling and Water Quality System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	PB
Flexible Connectors	PB
Heat Exchangers	PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Strainers	PB
Tanks	PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5.**

2.3.3.15 Building Heat System (044)

System Description

The Building Heat System maintains required temperatures for equipment protection and personnel comfort during the winter months. The Building Heat System is a plant-shared system. The Building Heat System is a forced hot water system that operates as required to maintain a minimum temperature of 55°F in various plant buildings including the reactor building. The hot water is heated by the Auxiliary Boiler System and preheats building intake air.

The Building Heat System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Building Heating System intended function is:

- Provide secondary containment boundary

The portions of the Building Heat System that contain components requiring an AMR are the piping and valves that form the secondary containment boundary.

UFSAR References

Additional detail for the Building Heat System is found in UFSAR **5.3.3.6** and **10.12.5**.

License Renewal Drawings

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

0-47E866-1-LR
0-47E866-2-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.15, Building Heat System.

The aging management review results for these component types are provided in Table **3.3.2.15**, Building Heat System (044) – Summary of Aging Management Evaluation.

Table 2.3.3.15 Building Heat System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Heaters	PB
Piping	PB
Pumps	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.16 Raw Water Chemical Treatment System (050)

System Description

The Raw Water Chemical Treatment System prevents bio-fouling of systems (including the EECW and RHRSW Systems) that use water from Wheeler Reservoir by providing the capability of injecting a biocide into the fluid stream.

The Raw Water Chemical Treatment System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Raw Water Chemical Treatment System intended function is:

- Provide pressure boundary integrity to RHRSW and EECW Systems

The portions of the Raw Water Chemical Treatment System that contain components that require an AMR extend from the interconnections with the EECW and RHRSW Systems to an isolation check valve and all other valves and piping inside the Intake Pumping Station building.

UFSAR References

Additional detail for the Raw Water Chemical Treatment System is found in the UFSAR Sections **10.7.3**, **10.8.4**, and **10.10.4.**

License Renewal Drawings

The license renewal drawing for the Raw Water Chemical Treatment System is listed below:

0-47E839-5-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.16, Raw Water Chemical Treatment System.

The aging management review results for these components are provided in Table **3.3.2.16**, Raw Water Chemical Treatment (050) – Summary of Aging Management Evaluation.

Table 2.3.3.16 Raw Water Chemical Treatment System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Restricting Orifice	FR
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.17 Demineralizer Backwash Air System (053)

System Description

The Demineralizer Backwash Air System supplies a high volume of low pressure air for backwashing plant demineralizers. The system is a plant-shared system. The system has two compressors located in the turbine building. The system supplies the condensate demineralizers in the turbine building and penetrates secondary containment to supply the Reactor Water Cleanup and FPC demineralizers in the reactor building. The Demineralizer Backwash Air System is normally in standby and is operated manually when required for backwashing demineralizers.

The Demineralizer Backwash Air System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Demineralizer Backwash Air System intended function is:

- Provide secondary containment boundary

The portion of the Demineralizer Backwash Air System that contains components that require an AMR are the piping, valves, and traps that form part of the secondary containment boundary.

UFSAR References

Additional detail for secondary containment penetrations is found in UFSAR **5.3.3**.

License Renewal Drawings

The license renewal drawing for the Demineralizer Backwash Air System is listed below:

0-47E846-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.17, Demineralizer Backwash Air System.

The aging management review results for these components are provided in Table **3.3.2.17**, Demineralizer Backwash Air System (053) – Summary of Aging Management Evaluation.

Table 2.3.3.17 Demineralizer Backwash Air System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Traps	PB
Valves	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.18 Standby Liquid Control System (063)

System Description

The SLC System provides a backup method, independent of control rods, to make the reactor subcritical over the full range of operating conditions.

Each unit has a separate SLC System. The SLC System is located in the Reactor Building. The SLC System is manually initiated from the Main Control Room to pump a boron neutron absorber solution into the reactor if the operator determines the reactor cannot be shut down or kept shut down with the control rods. The SLC System consists of a boron solution tank and two positive-displacement pumps. The liquid from the boron solution tank is pumped directly into the reactor vessel. The SLC System is normally in standby and must be manually initiated if required.

The SLC System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	Yes	No

The SLC System intended functions are:

- Provide RCPB
- Provide primary containment boundary

The portions of the SLC System that contain components that require an AMR extend from the boron solution tank to the reactor vessel penetration, Tank overflow line, Storage tank drain line, Test Tank drain line, and demineralized water lines. The SLC System components within the reactor vessel are addressed in the Reactor Vessel Internals section (Section **2.3.1.2**).

UFSAR References

Additional detail for the SLC System is found in UFSAR **3.8, 5.2.3**, and **7.19**.

License Renewal Drawings

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

1-47E854-1-LR **2-47E854-1-LR** **3-47E854-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.18, Standby Liquid Control System.

The aging management review results for these components are provided in Table 3.3.2.18, Standby Liquid Control System (063) – Summary of Aging Management Evaluation.

Table 2.3.3.18 Standby Liquid Control System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Tanks	PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.19 Off-Gas System (066)

System Description

The Off-Gas System includes subsystems that process and dispose of the gases produced during normal operation from the main condenser steam jet air ejectors, the startup condenser vacuum pumps, the condensate drain tank vent, and the steam packing exhauster. The Off-Gas System includes dilution fans and stack cubicle exhaust fans that provide dilution air for the main stack. One Off-Gas System is provided for each unit. The gases are processed to minimize the radioactive release and then are routed to the plant stack for dilution and elevated release to the atmosphere. The SGT System discharges into the Off-Gas System in the stack. Backdraft dampers limit the amount of a ground level radioactive release during accidents that require operation of the SGT System.

The Off-Gas System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Off-Gas System intended functions are:

- Provide flow path integrity for the release of the filtered SGT System gases to the stacks
- Provide automatic closure of back-draft prevention dampers to prevent back flow and potential ground level release of radiation

The portions of the Off-Gas System that contain components requiring an AMR include the stack piping and extend from the stack piping to back-draft dampers in the stack air dilution ducts, the stack cubicle exhaust ducts, and the normal operation process path discharges.

UFSAR References

Additional detail for the Off-Gas System is found in UFSAR **1.6.1.1.10**, **1.6.1.4.4**, **5.3.3**, **7.12.2**, **7.12.3**, **9.5**, **11.4**, **14.6.3.6**, and **F.7.14**.

License Renewal Drawings

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

1-47E809-2-LR **2-47E809-2-LR** **3-47E809-2-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.19, Off-Gas System.

The aging management review results for these components are provided in Table 3.3.2.19, Off-Gas System (066) – Summary of Aging Management Evaluation.

Table 2.3.3.19 Off-Gas System

Component Type	Intended Functions
Bolting	MC, SS
Ductwork	PB
Fittings	PB
Piping	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.20 Emergency Equipment Cooling Water System (067)

System Description

The EECW System provides:

- Cooling water to equipment that is essential for safe shutdown
- A backup cooling water supply to the Reactor Building Closed Cooling Water heat exchangers

The EECW System is a plant-shared system. The EECW System has two headers that use dedicated RHRSW pumps to supply water from Wheeler Reservoir to heat exchangers cooling the following equipment: DG engine coolers, CS pump room coolers, RHR pump seal coolers and room coolers, Control Bay chillers, H_2 and O_2 containment gas analyzers, and Electric Board Room chillers.

The EECW System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	No	Yes

The EECW System intended functions are:

- Provide cooling water to the HVAC system chillers, RHR system pump seal coolers, Containment Inerting System H_2 and O_2 gas analyzers, DG, RHR and CS equipment room coolers, and FPC system, provide EECW valve position interlock signal for auto-start RHRSW pumps
- Provide secondary containment boundary

The portion of the EECW System that contains components requiring an AMR extends from its supply interconnections with the RHRSW System, through heat exchangers cooling essential equipment, and then to discharges outside the reactor buildings and other structures containing the cooled equipment.

UFSAR References

Additional detail for the EECW System is found in UFSAR **5.3**, **7.18**, **10.10**, and **F.7.17**.

License Renewal Drawings

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

1-47E859-1-LR **2-47E859-1-LR** **3-47E859-1-LR**
3-47E859-2-LR
3-47E866-7-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.20, Emergency Equipment Cooling Water System.

The aging management review results for these components are provided in Table **3.3.2.20**, Emergency Equipment Cooling Water System (067) – Summary of Aging Management Evaluation.

Table 2.3.3.20 Emergency Equipment Cooling Water System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Flexible Connectors	PB
Heat Exchangers	HT, PB
Piping	PB
Restricting Orifice	PB, FR
Strainers	DP, PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.21 Reactor Water Cleanup System (069)

System Description

The Reactor Water Cleanup System:

- Maintains high reactor-water purity to limit corrosion, chemical interactions, fouling, and deposition on reactor heat transfer surfaces
- Removes corrosion products to limit impurities available for activation by neutron flux and the resultant radiation from deposition of corrosion products
- Provides a means for removal of water from the reactor vessel during normal operations

A separate Reactor Water Cleanup System is provided for each unit. Suction is taken from the reactor vessel bottom drain and from the RHR System shutdown cooling suction line, which is supplied by the Reactor Coolant Recirculation System. The processed fluid is returned to the reactor vessel via the FW System through the Reactor Coolant Isolation Cooling System and the HPCI (Unit 3 only), to the Radioactive Waste System, or to the main condenser. The major equipment of the Reactor Water Cleanup System is located in the Reactor Building and consists of two pumps, regenerative and non-regenerative heat exchangers, and two filter/demineralizers with supporting equipment. The Reactor Water Cleanup System normally operates. The Reactor Water Cleanup System automatically isolates upon accident initiation and upon SLC System actuation.

The RWCU recirculation pumps have been relocated to the cold section of the system downstream of the non-regenerative heat exchangers (Section F.13).

Intergranular Stress Corrosion Cracking mitigation measures have been implemented (Section F.5 and F.13).

The Reactor Water Cleanup System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	No	Yes

The Reactor Water Cleanup System intended functions are:

- Provide primary containment boundary
- Provide secondary containment boundary
- Provide RCPB
- Provide system pressure boundary support (check valve) to HPCI to prevent diversion of HPCI System core cooling water from the reactor vessel (Unit 3 only)

The portion of the Reactor Water Cleanup System that contains components requiring an AMR extends from the suctions from the reactor vessel bottom drain and the RHR shutdown cooling line through the outboard primary containment isolation valves, through the reactor building to include liquid filled piping, and then through the reactor water cleanup return isolation check valves to interconnections with the RCIC System and the HPCI System (Unit 3 only).

UFSAR References

Additional detail for the Reactor Water Cleanup System is found in UFSAR **3.8**, **4.1**, **4.9**, **5.2.3**, **5.3**, and **7.3**.

License Renewal Drawings

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

1-47E810-1-LR	**2-47E810-1-LR**	**3-47E810-1-LR**
1-47E822-1-LR	**2-47E822-1-LR**	**3-47E822-1-LR**
1-47E837-1-LR	**2-47E837-1-LR**	**3-47E837-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.21, Reactor Water Cleanup System.

The aging management review results for these component types are provided in Table **3.3.2.21**, Reactor Water Cleanup System (069) – Summary of Aging Management Evaluation.

Table 2.3.3.21 Reactor Water Cleanup System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	PB
Heat Exchangers	PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Restricting Orifice	PB
Strainers	PB
Tanks	PB
Traps	PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.22 Reactor Building Closed Cooling Water System (070)

System Description

The Reactor Building Closed Cooling Water System provides a continuous supply of cooling water during normal operation to designated plant equipment located in the primary and secondary containment. A separate Reactor Building Closed Cooling Water System is provided for each unit. However, a single spare pump and heat exchanger located in Unit 1 may also be used by Unit 2 or Unit 3 through unit crosstie piping. The major components of each unit's Reactor Building Closed Cooling Water System are located in its respective reactor building and consist of two pumps and two heat exchangers cooled by RCW. The system is a closed system. Water cooled in the heat exchangers provides cooling water for components such as the Reactor Recirculation System pumps and motor, the Reactor Water Cleanup System pumps and the non-regenerative heat exchanger, the FPC System heat exchanger, the drywell atmosphere cooling coils, the reactor building equipment drain sump heat exchanger, the drywell equipment drain sump heat exchanger, the drywell air compressors and aftercoolers, and sample coolers in the Sampling and Water Quality System. The system is normally operating. It automatically trips on accident initiation but may be restarted manually, if desired.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	No	Yes (**F.2**)

The Reactor Building Closed Cooling Water System intended functions are:

- Provide primary containment boundary
- Provide secondary containment boundary
- Provide pressure boundary of the Reactor Building Closed Cooling Water System components connected to the Control Air System that must maintain boundary in support of supplying CAD to the MSRVs (**F.2**)

The portion of the Reactor Building Closed Cooling Water System that contains components requiring an AMR includes the system piping within and penetrating through the reactor buildings and primary containment. This portion is essentially the entire system.

UFSAR References

Additional detail for the Reactor Building Closed Cooling Water System is found in UFSAR **5.2**, **5.3**, **10.6**, and **F.6.19**.

License Renewal Drawings

The license renewal drawings for the Reactor Building Closed Cooling Water System are listed below:

1-47E822-1-LR **2-47E610-70-1-LR** **3-47E610-70-1-LR**
2-47E822-1-LR **3-47E822-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.22, Reactor Building Closed Cooling Water System.

The aging management review results for these components are provided in Table **3.3.2.22**, Reactor Building Closed Cooling Water System (070)– Summary of Aging Management Evaluation.

Table 2.3.3.22 Reactor Building Closed Cooling Water System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Flexible Connectors	PB
Heat Exchangers	PB
Piping	PB
Pumps	PB
Strainers	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.23 Reactor Core Isolation Cooling System (071)

System Description

The RCIC System provides makeup water to the reactor vessel during shutdown and isolation from the main heat sink to supplement or replace the normal makeup sources.

The RCIC System for each unit shares no components with the other units except that each unit's RCIC pump may take suction from any unit's condensate storage tank. The RCIC System consists of a steam-turbine-driven pump unit located in the reactor building and associated valves and piping capable of delivering makeup water to the reactor vessel. The steam supply to the turbine comes from the MS line inboard of the MS isolation valves. The steam exhausts to the pressure suppression pool. The pump takes suction from the condensate storage tank or from the suppression pool. The pump discharges into the reactor vessel through a connection to the FW line. A test line to the condensate storage tank is provided. The RCIC System is normally in standby and initiates automatically when required. The RCIC System has automatic isolation provisions to ensure primary containment integrity.

The RCIC System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes (**F.3**)	Yes (**F.4**)	Yes (**F.7**)	Yes

The RCIC System intended functions are:

- Provide RCPB
- Provide primary containment boundary
- Provide system pressure boundary in support of RHR System (74) containment (torus) cooling function
- Provide secondary containment boundary
- Establish MSIV leakage pathway to condenser (**F.1**)
- Provide sufficient reactor coolant makeup to maintain the reactor in a safe condition

The portions of the RCIC System that contain components requiring an AMR extend 1) in the steam supply from the supply interconnection with the MS System through the turbine to the exhaust in the suppression pool and 2) in the water circuit from the pump's suction from the suppression pool and from the Condensate Storage Tank (interconnection with the CS System) through the pump to the reactor vessel injection (interconnection with the FW System) and test line to the Condensate Storage Tank. Turbine auxiliary components in the lubricating oil, gland exhaust subsystems, and turbine exhaust vacuum relief path also require an AMR. Portions of steam drain lines to the main condenser are credited in analyses for MS line alternate leakage treatment (Section **F.1**).

UFSAR References

Additional detail for the RCIC System is found in UFSAR **4.1, 4.7**, **5.2.3**, **5.3**, **7.3**, and **7.18**.

License Renewal Drawings

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

1-47E813-1-LR **2-47E813-1-LR** **3-47E813-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.23, Reactor Core Isolation Cooling System.

The aging management review results for these components are provided in Table **3.3.2.23**, Reactor Core Isolation Cooling System (071) – Summary of Aging Management Evaluation.

Table 2.3.3.23 Reactor Core Isolation Cooling System

Component Type	Intended Functions
Bolting	MC, SS
Condenser	PB
Expansion Joint	PB
Fittings	PB
Fittings - RCPB	PB
Flexible Connector	PB
Heat Exchangers	PB, HT
Piping	PB
Piping - RCPB	PB
Pumps	PB
Restricting Orifice	PB, FR
Restricting Orifice - RCPB	PB, FR
Strainers	DP, PB
Tanks	PB
Traps	PB
Tubing	PB
Turbines	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.24 Auxiliary Decay Heat Removal System (072) (Section F.11)

System Description

The Auxiliary Decay Heat Removal (ADHR) System can be used to remove residual heat from the spent fuel pool and reactor cavity during outages. The ADHR system supplements the FPC and Cleanup System.

The ADHR System consists of two cooling water loops. The primary cooling loop circulates spent fuel pool water entirely inside the Reactor Building and rejects heat from the spent fuel pool to a secondary loop by means of a heat exchanger. The secondary loop transfers heat to the atmosphere outside the Reactor Building by means of evaporative cooling towers.

The ADHR System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The ADHR System intended function is:

- Provide secondary containment boundary

The portions of the ADHR System that contain components that require an AMR extend through the secondary containment and include the piping located inside the reactor building.

Additional detail for the ADHR System is found in UFSAR **5.3, 10.5,** and **10.22**.

License Renewal Drawings

The license renewal drawing for the Auxiliary Decay Heat System is listed below:

0-47E873-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.24, ADHR System.

The aging management review results for these components are provided in Table **3.3.2.24**, Auxiliary Decay Heat Removal System (072) – Summary of Aging Management Evaluation.

Table 2.3.3.24 Auxiliary Decay Heat Removal System (Section F.11)

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Heat Exchangers	PB
Piping	PB
Pumps	PB
Strainers	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.25 Radioactive Waste Treatment System (077)

System Description

The Radioactive Waste Systems are plant-shared systems that are designed to process the liquid and solid radioactive wastes generated during plant operation.

The Liquid Radwaste System collects, treats, and returns processed radioactive liquid wastes to the plant for reuse. Treated radioactive wastes not suitable for reuse are discharged from the plant through the condenser circulating water discharge system or are solidified and processed as solid radwaste. The collection system consists of sumps, tanks, piping and pumps for equipment and floor drains located in various areas of the plant including the primary and secondary containments. Treatment systems are located in the radwaste building.

The Solid Radwaste System collects, processes, stores, packages, and prepares solid radioactive waste materials for transfer to approved onsite storage areas or shipment to offsite processing or disposal facilities. Processing equipment is located in the radwaste building.

Gaseous radwaste is processed through the Ventilation Systems (Sections 2.3.3.8 and 2.3.3.9), SGT System (Section 2.3.2.2), and Off-Gas System (Section 2.3.3.19).

The Radioactive Waste Treatment System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	No	Yes (F.2)

The Radioactive Waste Treatment System Intended functions are:

- Provide primary containment boundary
- Provide secondary containment boundary
- Provide piping interface integrity with the SBGT System and the Off-Gas System in support of release of the filtered SBGT gases through the stack
- Provide pressure boundary of the Radioactive Waste Treatment System components connected to the Control Air System that must maintain pressure boundary in support of supplying CAD to the MSRVs (F.2)

The portion of the Radioactive Waste System that contains components requiring an AMR extends in the Liquid Radwaste System through the primary containment and through the secondary containment. This section includes piping within the reactor building, such as Reactor Building floor drain pump discharge and reactor water cleanup demineralizer backwash piping. Also included are system components connecting to the SGT System and safety-related portion of the Off-Gas System.

UFSAR References

Additional detail for the Radioactive Waste Treatment System is found in UFSAR **4.10**, **5.2**, **5.3**, **9.1**, **9.2**, **9.3**, **9.5**, **10.16**, **F.6.7**, **F.6.8**, **F.6.20**, and **F.7.14**.

License Renewal Drawings

The license renewal drawings for the Radioactive Waste Treatment System are listed below:

1-47E852-1-LR
1-47E852-2-LR
1-47E856-2-LR
2-47E852-1-LR
2-47E852-2-LR
2-47E2847-9-LR
3-47E852-1-LR
3-47E852-2-LR
3-47E3847-9-LR
0-47E830-1-LR
0-47E830-5-LR
0-47E830-9-LR
0-47E851-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.25, Radioactive Waste Treatment System.

The aging management review results for these components are provided in Table **3.3.2.25**, Radioactive Waste Treatment System (077) – Summary of Aging Management Evaluation.

Table 2.3.3.25 Radioactive Waste Treatment System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Heat Exchangers	PB
Piping	PB
Pumps	PB
Restricting Orifice	PB
Strainers	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.26 Fuel Pool Cooling and Cleanup System (078)

System Description

The FPC and Cleanup System:

- Removes residual heat from the fuel assemblies and maintains the fuel pool water within specified temperature limits
- Minimizes corrosion product buildup and controls water clarity in the fuel pool water so that the fuel assemblies can be efficiently handled underwater
- Minimizes fission product concentration in the fuel pool water

The FPC and Cleanup System for each unit has two pumps that circulate the fuel pool water through a heat exchanger and a filter demineralizer. Each unit has two heat exchangers cooled by the Reactor Building Closed Cooling Water System. The FPC and Cleanup System has a cross-connection with the RHR System by which the RHR System can provide supplemental cooling. The pumps and heat exchangers are located in the Reactor Building. Four filter demineralizers are located in the Radwaste Building. One filter demineralizer is a spare that may be used by any unit. Provisions are made for secondary containment integrity. The system is normally operating. Provisions are made to prevent siphoning the fuel pool.

The FPC and Cleanup System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	No	No	No

The FPC and Cleanup System intended functions are:

- Provide secondary containment boundary
- Provide pressure boundary integrity at RHR/FPC interface
- Prevent inadvertent siphoning of the spent fuel pool

The portion of the FPC and Cleanup System that contains components requiring an AMR includes the water filled piping within the reactor building.

UFSAR References

Additional detail for the FPC and Cleanup System is found in UFSAR **4.8**, **5.3**, **10.5**, **10.17**, and **10.22**.

License Renewal Drawings

The license renewal drawings for the FPC and Cleanup System are listed below:

1-47E855-1-LR **2-47E855-1-LR** **3-47E855-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.26, Fuel Pool Cooling and Cleanup System.

The aging management review results for these components are provided in Table **3.3.2.26**, Fuel Pool Cooling and Cleanup System (078) – Summary of Aging Management Evaluation.

Table 2.3.3.26 Fuel Pool Cooling and Cleanup System

Component Type	Intended Functions
Bolting	MC, SS
Expansion Joint	PB
Fittings	PB
Heat Exchangers	PB
Piping	PB
Pumps	PB
Restricting Orifice	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.27 Fuel Handling and Storage System (079)

System Description

Each unit is provided with a dry new fuel storage vault. The new fuel storage racks provide a storage place in the new fuel storage vaults for new fuel. The racks are designed to preclude criticality even if the new fuel storage vault is flooded.

There are three spent fuel storage pools, one per reactor. A transfer canal is provided to join the Unit 1 and the Unit 2 pools. The spent fuel storage racks provide a storage place at the bottom of each fuel pool for the spent fuel received from the reactor vessel. The racks are full length, top entry, and are designed to maintain the spent fuel in a spatial geometry that precludes the possibility of criticality. The racks are made of staggered, stainless-steel container tubes. Each tube wall has a core of Boral sandwiched within stainless steel.

Servicing equipment is provided to facilitate refueling, fuel inspection and fuel maintenance.

The Fuel Handling and Storage System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Fuel Handling and Storage System intended function is:

- Provides nonsafety related components that ensure the satisfactory performance of safety-related components

The portions of the Fuel Handling and Storage System that contain components requiring an AMR are the Fuel Preparation Machines, Refueling Platform (assembly, rails, and the main fuel grapple) and the bolting and fasteners associated with the Refueling Platform and Fuel Preparation Machines.

Spent fuel pool components, new fuel storage vault components, and the fuel storage racks are evaluated as structural components. See Section **2.4.2.1** for Reactor Building component types.

UFSAR Reference

Additional descriptive information for the Fuel Handling and Storage System is found in UFSAR **10.2**, **10.3**, **10.4**, and **10.5**.

License Renewal Drawings

None.

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.27, Fuel Handling and Storage System.

The aging management review results for these components are provided in Table **3.3.2.27**, Fuel Handling and Storage System (079) – Summary of Aging Management Evaluation.

Table 2.3.3.27 Fuel Handling and Storage System

Component Type	Intended Functions
Bolting and Fasteners	SS
Fuel Preparation Machines	SS
Refueling Platform (Assembly, Rails, Main Fuel Grapple)	SS

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.28 Diesel Generator System (082)

System Description

The DG System provides an alternate source of power to the ECCS and the safe shutdown systems when the normal power supplies are not available.

The DG System is a plant-shared system. The DG System consists of four independent DG units coupled as an alternate independent source of power to four 4160-V shared shutdown boards for Units 1 and 2. There are four additional DG units that provide an alternate independent source of power to four Unit 3 4160-V shutdown boards. Breaker ties allow a U1 and U2 DG to feed a U3 shutdown board. The same breaker ties allow a U3 DG to feed a U1 and U2 shutdown board. The DGs are normally in standby and start automatically when required. The DGs are located in the DG Buildings.

The DG System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	Yes	No	Yes

The DG System intended functions are:

- Start standby AC power source for 4kV system
- Provide power to 4kV system upon DG availability and loss of off-site power
- Provide DG power to diesel fuel transfer pumps

The portions of the DG System that contain components requiring an AMR include the lubrication, engine water cooling, engine air intake, engine exhaust, and generator air cooling subsystems. The fuel oil components are described in Fuel Oil System (Section **2.3.3.2**).

UFSAR References

Additional detail for the DG System is found in UFSAR **7.4**, **7.18**, **8.4, 8.5**, **8.10**, and **F.7.9**.

License Renewal Drawings

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

3-47E861-5-LR	**0-47E861-5-LR**
3-47E861-6-LR	**0-47E861-6-LR**
3-47E861-7-LR	**0-47E861-7-LR**
3-47E861-8-LR	**0-47E861-8-LR**
3-47E865-8-LR	**0-47E865-8-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.28, Diesel Generator System.

The aging management review results for these components are provided in Table **3.3.2.28**, Diesel Generator System (082) – Summary of Aging Management Evaluation.

Table 2.3.3.28 Diesel Generator System

Component Type	Intended Functions
Bolting	MC, SS
Ductwork	PB
Fan (Housings)	PB
Fittings	PB
Flexible Connectors	PB
Heat Exchangers	HT, PB
Heaters	PB
Piping	PB
Pumps	PB
Silencer	PB
Strainers	DP, PB
Tanks	PB
Tubing	PB
Valves	PB
Valves –RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.29 Control Rod Drive System (085)

System Description

The CRD System provides reactivity control by:

- Allowing positioning of the control rods at a controlled rate during normal operation
- Providing scram and diverse scram (ATWS - alternate rod insertion)(Section **F.7**) functions to ensure a rapid shutdown when required
- Limiting rod drop rate to minimize the consequences of a rod drop accident
- Limiting a rod ejection accident

Each unit has separate hydraulic CRDs and Hydraulic Control Units that control flow from the CRD Hydraulic subsystem for the following purposes:

- Scram to rapidly and fully insert all control rods when a scram is required; a combination of accumulator and reactor pressure provides the motive upward force with the exhaust at essentially atmospheric pressure in the scram discharge volume
- Normal drive flow to re-position individual control rods at slow speed when required; used for control rod positioning during normal plant operations
- Cooling water flow that continually ensures required cooling of all CRDs without control rod motion

A scram discharge volume receives the water displaced from the drives during a scram and maintains the RCPB and primary containment integrity. Control rod drop speed is limited by an integral velocity limiter and a control rod ejection is limited by the CRD housing support.

The CRD Hydraulic subsystem is a plant-shared system. Each unit has its dedicated pump that takes suction from the Condensate Transfer System. There is a spare pump shared between U1 and U2. Unit 3 has a dedicated spare pump. Provisions are made for the integrity of the RCPB, the primary containment, and the secondary containment.

The CRD System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	Yes (**F.7**)	Yes

The CRD System intended functions are:

- Provide primary containment boundary
- Provide secondary containment boundary
- Provide RCPB
- Provide housing support to keep rods in place
- Limit rod drop rate to less than 3.11 ft/sec

The portions of the CRD System that contain components requiring an AMR extend from the system's suction from the condensate storage and transfer system through the CRD pumps, then through the combined flow and pressure control stations to hydraulic control units, one for each control rod. The hydraulic control units require an AMR. From the hydraulic control units, the portions of the system that require an AMR extends to and from each control rod housing. From the hydraulic control units, the portions of the system that require an AMR also extend to and then includes the Scram Discharge Volume and associated components. From the hydraulic control units, the portions of the system that require an AMR also extend to an inter-connection with the Reactor Water Cleanup (RWCU) System.

The CRDs are short-lived and do not require an AMR. The CRD housing support requires an AMR. It is included in the Component Supports Commodity Group (Section **2.4.8.1**).

UFSAR References

Additional detail for the CRD System is found in UFSAR **3.4**, **3.5**, **3.7**, **5.2.3**, **5.3**, **7.7**, **7.19**, and **F.7.12**.

License Renewal Drawings

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

1-47E810-1-LR	**2-47E810-1-LR**	**3-47E810-1-LR**	**0-47E820-1-LR**
1-47E820-2-LR	**2-47E820-2-LR**	**3-47E820-2-LR**	
1-47E820-6-LR	**2-47E2820-6-LR**	**3-47E820-6-LR**	
1-47E844-2-LR	**2-47E844-2-LR**	**3-47E844-2-LR**	

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.29, Control Rod Drive System.

The aging management review results for these components are provided in Table **3.3.2.29**, Control Rod Drive System (085) – Summary of Aging Management Evaluation.

Table 2.3.3.29 Control Rod Drive System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	PB
Heat Exchangers	PB
Piping	PB
Piping - RCPB	PB
Pumps	PB
Restricting Orifice	PB
Rupture Disk	PB
Strainers	PB
Strainers - RCPB	PB
Tanks	PB
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.30 Diesel Generator Starting Air System (086)

System Description

The Diesel Generator (DG) Starting Air System starts the DGs when required.

Each DG has its own independent Starting Air System. The Starting Air System for each DG consists of two independent subsystems, either one of which can start the DG. Each subsystem consists of an air compressor with associated filters and coolers and a bank of air receivers. The air compressors operate automatically to maintain the receivers pressurized. The DG Starting Air System is located in the DG Buildings.

The DG Starting Air System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The DG Starting Air System intended function is:

- Provide diesel starting air to DG System

The portion of the DG Starting Air System that contains components requiring an AMR extends from the air dryer discharge check valves through the air receivers to the air start motors for each diesel.

UFSAR References

Additional detail for the DG Starting Air System is found in UFSAR **8.5.3.3**.

License Renewal Drawings

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

3-47E861-1-LR	**0-47E861-1-LR**
3-47E861-2-LR	**0-47E861-2-LR**
3-47E861-3-LR	**0-47E861-3-LR**
3-47E861-4-LR	**0-47E861-4-LR**
3-47E861-5-LR	**0-47E861-5-LR**
3-47E861-6-LR	**0-47E861-6-LR**
3-47E861-7-LR	**0-47E861-7-LR**
3-47E861-8-LR	**0-47E861-8-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.30, Diesel Generator Starting Air System.

The aging management review results for these components are provided in Table 3.3.2.30, Diesel Generator Starting Air System (086) – Summary of Aging Management Evaluation.

Table 2.3.3.30 Diesel Generator Starting Air System

Component Type	Intended Functions
Bolting	MC, SS
Diesel Air Start Motor	PB
Fittings	PB
Flexible Connectors	PB
Piping	PB
Strainers	DP, PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.3.31 Radiation Monitoring System (090)

System Description

A number of radiation monitors and monitoring systems are provided on process liquid and gas lines that may serve as discharge routes for radioactive materials. The monitors include the following:

- Main Steam Line Radiation Monitoring System
- Air Ejector Offgas Radiation Monitoring System
- Main Stack Radiation Monitoring System
- Process Liquid Radiation Monitors (RHRSW discharge, RCW discharge, Liquid Radioactive Waste discharge, Reactor Building Closed Cooling Water)
- Reactor Building Ventilation Radiation Monitoring System
- Plant Ventilation Exhaust Radiation Monitoring System

The Drywell Leak Detection Radiation Monitoring System consists of three Continuous Air Monitors, one per unit. Each Continuous Air Monitor continuously pumps drywell atmosphere past a detector and returns the air to the drywell.

Area Radiation Monitoring Systems are provided to warn of abnormal gamma radiation levels in areas where radioactive material may be present, stored, handled, or inadvertently introduced.

The Radiation Monitoring System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	Yes (F.4)	No	No

The Radiation Monitoring System Intended functions are:

- Provide primary containment boundary
- Provide system pressure boundary integrity (with all mechanical joints and components associated with the off-line liquid monitors) to RHRSW System cooling water for RHR System heat exchangers
- Provide secondary containment boundary

The portion of Radiation Monitoring System that contains components requiring an AMR include ventilation radiation monitoring, plant gaseous effluents monitoring, drywell radiation monitoring, Reactor Building Closed Cooling Water effluent radiation monitor, RCW effluent radiation monitor, and the RHRSW discharge radiation monitors.

UFSAR References

Additional detail for the Radiation Monitoring System is found in UFSAR **5.2.3**, **7.12**, **7.13**, **7.14**, **7.15**, and **F.7.5**.

License Renewal Drawings

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

1-47E610-90-1-LR **2-47E610-90-1-LR** **3-47E610-90-1-LR** **0-47E610-90-2-LR**
1-47E610-90-3-LR **2-47E610-90-3-LR** **3-47E610-90-3-LR** **0-47E610-90-4-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.31, Radiation Monitoring System.

The aging management review results for these components are provided in Table **3.3.2.31**, Radiation Monitoring System (090) – Summary of Aging Management Evaluation.

Table 2.3.3.31 Radiation Monitoring System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Flex Hose	PB
Piping	PB
Pumps	PB
Strainers	PB
Traps	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.32 Neutron Monitoring System (092)

System Description

The Neutron Monitoring System detects conditions in the core that threaten the overall integrity of the fuel barrier due to excessive power generation. It provides signals to the Reactor Protection System, so that the release of radioactive material from the fuel barrier is limited. In addition, the Neutron Monitoring System provides information for the efficient, expedient operation and control of the reactor. The Neutron Monitoring System detects conditions that could lead to local fuel damage and provides signals that can be used to prevent such damage. The Neutron Monitoring System for each unit is independent from the other units and consists of six major subsystems as follows:

- Source Range Monitor Subsystem
- Intermediate Range Monitor Subsystem
- Local Power Range Monitor Subsystem
- Average Power Range Monitor Subsystem
- Rod Block Monitor Subsystem
- Traversing In-Core Probe (TIP) Subsystem (Scoping and screening results are presented independently in Section **2.3.3.33**.)

The Source Range Monitor Subsystem and the Intermediate Range Monitor Subsystem consists of detectors, signal conditioning circuits, and trip circuits. The Local Power Range monitor subsystem consists of detectors that provide input to the Average Power Range Monitor Subsystem and the Rod Block Monitor Subsystem. The Average Power Range Monitor Subsystem averages the Local Power Range Monitor subsystem signals to provide an overall indication of reactor power for control and trip functions. A sub-system of the Average Power Range Monitor Subsystem (the Oscillation Power Range Monitor) ensures reactor operation in a stable thermal-hydraulic region. The Rod Block Monitor receives input from Local Power Range Monitors close to a control rod to prevent fuel damage in the event of a rod withdrawal error.

The Local Power Range Monitor assemblies and the Source Range Monitor/ Intermediate Range Monitor dry tubes are inserted into the Reactor Vessel through bottom head penetrations that form part of the RCPB. They are evaluated with the Reactor Vessel Internals (Section **2.3.1.2**).

The Neutron Monitoring System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Neutron Monitoring System intended function is:

- Provide RCPB

The portions of the Neutron Monitoring System that contain components subject to an AMR are those that form part of the RCPB.

UFSAR References

Additional detail for the Neutron Monitoring System is found in UFSAR **3.7** and **7.5.**

License Renewal Drawings

None.

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.32, Neutron Monitoring System.

The aging management review results for these components are provided in Table **3.3.2.32**, Neutron Monitoring System (092) – Summary of Aging Management Evaluation.

Table 2.3.3.32 Neutron Monitoring System

Component Type	Intended Functions
Bolting	MC, SS
Fittings - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.33 Traversing In-Core Probe System (094)

System Description

The TIP System provides a signal proportional to the axial flux distribution at selected core locations where Local Power Range Monitor detector assemblies are located. This signal allows reliable calibration of Power Range Monitor amplifiers. The TIP drive mechanism uses a detector attached to a flexible drive cable, which is driven from outside the primary containment by a gear box assembly. The flexible cable is contained by guide tubes that penetrate the reactor vessel and continue into the reactor core through a dry tube in a Local Power Range Monitor assembly (evaluated with Reactor Vessel Internals Section **2.3.1.2**). Provisions are made for automatic retraction of the detection and isolation of the primary containment penetration when required.

The TIP System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The TIP System Intended functions are:

- Provide primary containment boundary isolation and integrity (Active isolation function is not required)
- Provide RCPB (Passive function only)

The portion of the TIP System that contains components requiring an AMR extends from the primary containment to the isolation valve assembly.

UFSAR References

Additional detail for the TIP System is found in UFSAR **5.2.3**, **7.3**, and **7.5**.

License Renewal Drawings

The license renewal drawings for the Traversing In-Core System are listed below.

1-47E600-14-LR **2-47E600-14-LR** **3-47E600-14-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.33, Traversing In-Core Probe System.

The aging management review results for these components are provided in Table **3.3.2.33**, Traversing In-Core Probe System (094) – Summary of Aging Management Evaluation.

Table 2.3.3.33 Traversing In-Core Probe System

Component Type	Intended Functions
Fittings	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.3.34 Cranes System (111)

System Description

The Cranes System includes numerous plant load-handling devices that are used for maintenance of selected plant components.

The Cranes System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	Yes	No	No	No	No

The Cranes System intended function is:

- Provides nonsafety-related components that ensure the satisfactory performance of safety related components

The portion of the Cranes System that contains components requiring an AMR includes the structural portions of cranes in structures with safety-related components.

UFSAR References

Additional detail for the Cranes System is found in UFSAR **12.2**.

License Renewal Drawings

None.

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.3.34, Cranes System.

The aging management review results for these components are provided in Table **3.3.2.34**, Cranes System (111) – Summary of Aging Management Evaluation.

Table 2.3.3.34 Cranes System

Component Type	Intended Functions
Bolting and Fasteners	SS
Monorails	SS
Rail/Rail Clips/Structural Girders	SS

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.4 Steam and Power Conversion Systems

The Steam and Power Conversion Systems function to convert the steam produced by the Nuclear Steam Supply to electricity and then close the thermodynamic cycle by returning the condensed steam to the Nuclear Steam Supply as Feedwater. The following systems are included in this subsection:

Section	System Number	System Name
2.3.4.1	001	Main Steam
2.3.4.2	002	Condensate and Demineralized Water
2.3.4.3	003	Feedwater
2.3.4.4	006	Heater Drains and Vents
2.3.4.5	008	Turbine Drains and Miscellaneous Piping
2.3.4.6	027	Condenser Circulating Water
2.3.4.7	037	Gland Seal Water

2.3.4.1 Main Steam System (001)

System Description

The MS System for each unit consists of four MS lines that transfer steam from reactor vessel to the various steam loads in the turbine building during normal plant operation. Two MS Isolation Valves are provided in each steam line to isolate the RCPB and the primary containment. Steam supply lines for the HPCI and the RCIC Systems branch off the MS lines between the reactor vessel and the MS Isolation Valves. A flow restrictor is provided in each MS line. The flow restrictor allows for measurement of steam flow and limits the steam flow rate in the event of a downstream steam line break. Thirteen MSRVs are provided on the MS lines upstream of the flow restrictors for overpressure protection and for depressurization following Small Break Loss of Coolant Accidents. The MS System for each unit shares no components with the other units.

Main Steam components downstream of the MS Isolation Valves are credited in analyses for MS Isolation Valve alternate leakage treatment (Section **F.1**).

The MS System is in the scope of 10 CFR 54 because it contains components that meet the criteria of 10 CFR 54.4 for the following paragraphs:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	No	Yes

The MS System Intended functions are:

- Open safety relief valves (SRVs) on high reactor pressure to provide RPV pressure relief
- Main steamline flow restrictors passively limit the mass flow rate of coolant being ejected following a steamline break until MSIV closure occurs
- Provide RCPB
- Provide primary containment boundary
- Provide secondary containment boundary
- Provide steam for HPCI turbine
- Establish MSIV leakage pathway to condenser (Section **F.1**)
- Provide steam for RCIC turbine

The portion of the MS System that contains components subject to an AMR extends from the reactor vessel through the outboard MS Isolation Valves to the secondary containment boundary. It then extends to the first isolation valve for each load in the turbine building and through drains to the main condenser (Section **F.1**).

UFSAR References

Additional details for the MS System are found in UFSAR **3.7**, **4.1**, **4.4**, **4.5**, **4.6**, **4.11**, **5.2.3**, **5.3**, **6.4.2**, **7.2**, **7.3**, **7.4**, **7.10**, **7.11**, **7.12**, **7.18**, **11.2**, and **11.5**.

License Renewal Drawings

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

1-47E1847-6-LR	**2-47E2847-5-LR**	**3-47E3847-5-LR**
1-47E1847-10-LR	**2-47E2847-9-LR**	**3-47E3847-9-LR**
1-47E801-1-LR	**2-47E801-1-LR**	**3-47E801-1-LR**
	2-47E801-2-LR	**3-47E801-2-LR**
	2-47E807-1-LR	**3-47E807-1-LR**
	2-47E807-2-LR	**3-47E807-2-LR**

Components Subject to AMR

The components types that require aging management review are indicated in Table 2.3.4.1, Main Steam System.

The aging management review results for these component types are provided in Table **3.4.2.1**, Main Steam System (001) – Summary of Aging Management Evaluation.

Table 2.3.4.1 Main Steam System

Component Type	Intended Function
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	FR, PB
Piping	PB
Piping - RCPB	PB
Restricting Orifice (**F.1**)	PB
Restricting Orifice – RCPB	FR, PB
Strainers (**F.1**)	PB
Tubing	PB
Valves (**F.1**)	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.4.2 Condensate and Demineralized Water System (002)

System Description

The Condensate System provides treated water at required flow rates for the FW System during normal plant operation. The Condensate System for each unit shares no components with the other units. The Condensate System for each unit consists of the turbine-generator condenser and piping to transfer water from the turbine-generator condenser to the FW System. The turbine-generator condenser provides a heat sink for the closed loop steam cycle and removes non-condensable gases. The Condensate System has three motor-driven condensate pumps and three motor-driven condensate booster pumps. Impurities are removed by a Full Flow Demineralizer System. The water is heated by three sets of low pressure heaters. The Condensate System cools the steam jet air ejector intercondenser, the Off-Gas condenser, and the steam packing exhauster condenser. Major components are located in the turbine building.

The condenser is credited in analyses for MS Isolation Valve alternate leakage treatment (Section **F.1**).

Subsystems are the Condensate Storage and Transfer System (radioactive high purity water) and the Demineralized Water System (non-radioactive high purity water). These are shared systems. The Condensate Water Storage Tanks that are the preferred source of water to the HPCI and RCIC Systems, provide a surge volume for flow testing of HPCI, RCIC and CS Systems, provide condenser makeup, and a supply to the CRD System. The Condensate Water Storage Tanks and the Demineralized Water Storage Tank provide high purity water for miscellaneous makeup uses throughout the plant including the reactor building. The tanks are located in the yard and major components are located in the turbine building.

An original connection to the primary containment is in place but has been capped and sealed (Section **F.10**).

The Condensate and Demineralized Water System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	No	No	Yes

The Condensate and Demineralized Water System Intended functions are:

- Provide normally open water supply to RHR System piping flow path which continues to HPCI System piping upstream of HPCI System pump
- Provide secondary containment boundary
- Provide primary containment boundary
- Provide a water supply for both HPCI and RCIC during a Station Blackout

The portions of the Condensate, Condensate Storage and Transfer, and Demineralized Water subsystems that contain components subject to an AMR include the condenser (Section **F.1**), the Condensate Water Storage Tanks that provide the normal supplies to the units, piping from the Condensate Water Storage Tanks to interconnections with the HPCI and RCIC Systems, and subsystem components required to assure primary containment and secondary containment integrity. Water-filled piping in the Reactor Building, and in proximity to safety-related system and components, also requires an AMR.

UFSAR References

Additional descriptive information for the Condensate and its Condensate Storage and Transfer and Demineralized Water subsystems is found in UFSAR **10.13**, **11.8**, **11.9**, **F.6.10**, and **F.6.18**.

License Renewal Drawings

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

1-47E804-1-LR	**2-47E801-1-LR**	**3-47E801-1-LR**	**0-47E856-1-LR**
1-47E818-1-LR	**2-47E804-1-LR**	**3-47E804-1-LR**	
1-47E822-1-LR	**2-47E818-1-LR**	**3-47E818-1-LR**	
1-47E856-2-LR	**2-47E822-1-LR**	**3-47E822-1-LR**	
1-47E1847-4-LR	**2-47E856-2-LR**	**3-47E856-2-LR**	

Components Subject to AMR

The list of Condensate and Demineralized Water System components/commodities subject to an AMR and their passive intended functions is shown on Table 2.3.4.2, Condensate and Demineralized Water System.

The AMR results are presented in Table **3.4.2.2,** Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation.

Table 2.3.4.2 Condensate and Demineralized Water System

Component Type	Intended Functions
Bolting	MC, SS
Condenser (F.1)	PL
Expansion Joint	PB
Fittings	PB
Piping	PB
Pumps	PB
Restricting Orifice	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section 2.3.5.

2.3.4.3 Feedwater System (003)

System Description

The FW System provides demineralized water at an elevated temperature to the reactor vessel during normal plant operations.

The FW System for each unit shares no components with the other units. The Feedwater System for each unit consists of three variable speed steam turbine driven pumps and three strings of feedwater heaters located in the turbine building. Feedwater is fed to the reactor vessel through six feedwater inlet nozzles. The FW System takes suction from the Condensate System, and then delivers feedwater to the reactor vessel at a controlled rate to maintain stable reactor vessel water level. The Feedwater System provides a flow path to the reactor vessel for the HPCI, RCIC, and Reactor Water Cleanup Systems. The FW components inside the reactor pressure vessel are evaluated in Section **2.3.1.2**, Reactor Vessel Internals. The FW System includes the reactor vessel flange leak-off line.

The Feedwater System is in the scope of 10 CFR 54 because it contains components that meet the criteria of the following 10 CFR 54.4 paragraphs:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	Yes (**F.7**)	Yes (**F.2**)

The FW System intended functions are:

- Provide RCPB
- Provide primary containment boundary
- Provide secondary containment boundary
- Provide path for HPCI System flow to the RPV through the feedwater spargers
- Provide injection path for RCIC
- Provide pressure boundary of the FW System components connected to the Control Air System that must maintain pressure boundary In support of supplying CAD to the MSRVs (**F.2**)

The portions of the Feedwater System that contain components requiring an AMR extend from the secondary containment to the reactor vessel.

UFSAR Reference

Additional descriptive information for the Feedwater System is found in UFSAR paragraphs **3.7**, **4.2**, **4.7.5**, **4.9**, **4.11**, **5.2.3**, **5.3**, **6.4.1**, **7.2**, **7.3, 7.4**, **7.8**, **7.10**, **10.17** and **11.8**.

License Renewal Drawings

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

1-47E803-1-LR	**2-47E2847-9-LR**	**3-47E3847-9-LR**
1-47E817-1-LR	**2-47E803-1-LR**	**3-47E803-1-LR**
	2-47E803-5-LR	**3-47E803-5-LR**
		3-47E817-1-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4.3, Feedwater System.

The aging management review results for these component types are provided in Table **3.4.2.3**, Feedwater System (003) - Summary of Aging Management Evaluation.

Table 2.3.4.3 Feedwater System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Fittings - RCPB	PB
Piping	PB
Piping - RCPB	PB
Restricting Orifice - RCPB	PB, FR
Tubing	PB
Valves	PB
Valves - RCPB	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.4.4 Heater Drains and Vents System (006) (Section F.1)

System Description

The Heater Drains and Vents System controls and contains the drains and vent paths from the various heaters associated with the main turbine cycle. The Heater Drains and Vents System for each unit share no components with the other units.

The Heater Drains and Vents System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Heater Drains and Vents System intended function is:

- Establish MSIV leakage pathway to condenser (Section **F.1**)

The portions of the Heater Drains and Vents System that contain components requiring an AMR are those that connect to the MS System piping or the condenser to support the MS isolation valve alternate leakage treatment flow path to the condenser. The in-scope piping is either closed loop from the MS System to the condenser or terminates at a valve expected to be closed post accident.

UFSAR References

Additional detail for the Heater Drains and Vents System is found in UFSAR **11.8**.

License Renewal Drawings

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

2-47E801-2-LR **3-47E801-2-LR**
2-47E805-3-LR **3-47E805-3-LR**
2-47E807-1-LR **3-47E807-1-LR**
2-47E807-2-LR **3-47E807-2-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4.4, Heater Drains and Vents System.

The aging management review results for these components are provided in Table **3.4.2.4**, Heater Drains and Vents System (006) – Summary of Aging Management Evaluation.

Table 2.3.4.4 Heater Drains and Vents System (Section F.1)

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Traps	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.4.5 Turbine Drains and Miscellaneous Piping System (008) (Section F.1)

System Description

The Turbine Drains and Miscellaneous Piping System directs controlled leakage from various MS System components to the condenser. The Turbine Drains and Miscellaneous Piping System for each unit shares no components with the other units.

The Turbine Drains and Miscellaneous Piping System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Turbine Drains and Miscellaneous Piping System intended function is:

- Establish MSIV leakage pathway to condenser (**F.1**)

The portions of the Turbine Drains and Miscellaneous Piping System that contain components requiring an AMR are those that connect to MS System components to support the MS isolation valve alternate leakage treatment flow path to the condenser.

UFSAR References

None.

License Renewal Drawings

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

2-47E807-2-LR **3-47E807-2-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4.5, Turbine Drains and Miscellaneous Piping System.

The aging management review results for these components are provided in Table **3.4.2.5**, Turbine Drains and Miscellaneous Piping System (008) – Summary of Aging Management Evaluation.

Table 2.3.4.5 Turbine Drains and Miscellaneous Piping System

Component Type	Intended Functions
Bolting	MC, SS
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**

2.3.4.6 Condenser Circulating Water System (027)

System Description

The Condenser Circulating Water System:

- Provides an efficient means of rejecting waste heat from the power generation cycle into the ambient surroundings, while meeting all applicable thermal criteria.
- Provides water for the RCW System.
- Dilutes and disperses low-level radioactive liquid waste from the radwaste treatment facilities.
- Provides a discharge path for station sumps and sewage treatment plant.
- Prevents backflow from the cooling tower warm water channel to the forebay upon trip of the Condenser Circulating Water pumps. This method protects the decay heat removal functions of the RHRSW and the cooling functions of the EECW Systems post accident.

The Condenser Circulating Water System for each unit shares components with the other units. Each unit has three circulation water pumps that take water from a common intake channel in Wheeler Reservoir. After passing through the condensers the heated water is cooled by the cooling towers or discharged directly back to Wheeler Reservoir. Provisions (a loop in the discharge conduit with a vacuum breaker) are made for the prevention of backflow of heated water into the intake channel that serves as the ultimate heat sink if normal offsite power is lost. The Condenser Circulating Water System for each unit normally operates independently, however a cross-tie is provided between the three Condenser Circulating Water tunnels so that any one pump in an emergency can supply water to all units. One Condenser Circulating Water pump has more than adequate capacity to dissipate the shutdown heat for the three units.

The Condenser Circulating Water System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Condenser Circulating Water System Intended function is:

- Provide manual vacuum breaking capability to prevent backflow from cooling tower warm channel into the forebay upon trip of the CCW pumps

The portion of the Condenser Circulating Water System that contains components requiring an AMR extends in the discharge vacuum breaking piping from the discharge conduit to an atmospheric vent.

UFSAR References

Additional detail for the Condenser Circulating Water System is found in UFSAR **2.4.2.2.2**, **11.6**, **12.2.7**, and **F.6.4**.

License Renewal Drawings

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

1-47E831-3-LR **2-47E831-3-LR** **3-47E831-3-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4.6, Condenser Circulating Water System.

The aging management review results for these component types are provided in Table **3.4.2.6**, Condenser Circulating Water System (027) – Summary of Aging Management Evaluation.

Table 2.3.4.6 Condenser Circulating Water System

Component Type	Intended Function
Bolting	MC, SS
Fittings	SS
Piping	SS
Strainers	SS
Tubing	SS
Valves	SS

Note: Additional information concerning component types is located in Section **2.3.5**.

2.3.4.7 Gland Seal Water System (037)

System Description

The Gland Seal Water System provides pressurized sealing water to condenser and Condensate System components that are under a vacuum to prevent air leakage into the condenser. The Gland Seal Water System for each unit shares no components with the other units. However, any unit's Gland Seal Tank may pressurize any other unit's system. The Gland Seal Water System for each unit has an elevated Gland Seal Tank located in the Reactor Building and associated piping that maintains a static pressure on seals (e.g., packing) of components of the main condenser and Condensate Systems that are under vacuum during normal plant operations.

The Gland Seal Water System is in the scope of 10 CFR 54 because it contains components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Gland Seal Water System intended function is:

- Provide secondary containment boundary

The portion of the Gland Seal Water System that contains components requiring an AMR extends from the gland seal water tank through the secondary containment boundary.

UFSAR References

The Gland Seal Water System is not specifically described in the UFSAR. Additional detail for secondary containment piping penetrations is found in UFSAR **5.3.3.5**.

License Renewal Drawings

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

1-47E841-1-LR **2-47E841-1-LR** **3-47E841-1-LR**

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.3.4.7, Gland Seal Water System.

The aging management review results for these components are provided in Table **3.4.2.7**, Gland Seal Water System (037) – Summary of Aging Management Evaluation.

Table 2.3.4.7 Gland Seal Water System

Component Type	Intended Functions
Bolting	MC, SS
Fittings	PB
Piping	PB
Tanks	PB
Tubing	PB
Valves	PB

Note: Additional information concerning component types is located in Section **2.3.5**

2.3.5 Notes Associated with Section 2.3 Tables

The Component Types listed in Section 2.3 tables may be comprised of the following components:

Attachments and Welds

Vessel inside diameter bracket attachment welds for steam dryer support and hold down, FW sparger, guide rod, surveillance sample holder, CS piping, and jet pump riser

Heads, Flanges, and Shell

Also includes beltline welds and vessel flange leak detection line

Nozzles

Vent, spare, head spray, MS, FW recirculation inlet and outlet, CS, and CRD return (capped)

Nozzles Safe Ends

Vent, spare, head spray, MS, FW recirculation inlet and outlet, CS, and CRD return (capped)

Other External Attachments

Head lifting lugs, insulation supports, and associated attachment welds

Penetrations

Control rod drive stub tubes, instrumentation nozzles and nozzle ends; jet pump instrumentation nozzles and nozzle ends; core ΔP and standby liquid control (SLC) nozzle and nozzle end; flux monitor housings; and drain line nozzle and nozzle end

Refueling Bellows Support Skirt

Including attachment weld

Stabilizer Bracket

Including attachment weld

Core Shroud and Plate

Core shroud, core plate, bolting/aligners, access hole covers, and shroud support structure

Core Spray Lines and Spargers

CS lines including repair hardware, spray ring, spray nozzles, thermal sleeves, and supports including brackets/clamps/bolting

Dry Tubes and Guide Tubes

Incore neutron flux monitor guide tubes

Fuel Support

Four lobed and peripheral fuel support pieces

Jet Pump Assemblies

Thermal sleeve, beam/bolt assembly, riser pipe, transition piece, inlet, mixer, restraint bracket and wedge assembly, diffusers and tailpipe, adapter ring, and riser brace including riser brace repair components

The Component Types listed in the tables in Section 2.3 may be comprised of the following component UNIDs that are assigned on LR boundary drawings. The abbreviations in parenthesis are referenced for license renewal boundary drawing representation only and are not utilized as acronyms within the License Renewal Application text.

Ductwork

Air Conditioning Unit (ACU)
Air Handling Unit (AHU)
Dampers (BKD), (BLD), (FCO), (TCO), (XFD), or (DMP)
Fan Housing (FAN)
Filter Housing (FLT)
Moisture Separator in Standby Gas Treatment System (SEP)

Fan Housings

Blower (BLW)

Fire Dampers

(DMP), (FCO), or (XFD)

Fittings

Air Line Lubricator (LUB)
Corrosion Monitoring Access Fitting (SMCH)
Damper Operator in the CO_2 System (PCO)
Elements (CE), (FE), (LE), (ME), (FS), (TE), (TI), (TS), or (XS)
Flame Arrestor in Fuel Oil System (FAR)
Jet Exhauster in Fuel Oil System (EXH)
Moister Indicator in Air Conditioning System (MI)
Nozzle (NZL)
Odorizer in CO_2 System (CO2O)
Restricting Orifice in Raw Cooling Water System (PRO)
Sight Glass (FG) or (LG)
Temperature Well (TW)
Test Port (TP)
Thermostats (TC)
Truck Fill Box in Standby Gas Treatment System (EQSP)
Vibration Eliminator in Air Conditioning System (VB)

Flexible Connectors

(FLEX) or (HOSE)

Heat Exchangers

Chiller (CHR)
Condenser (CND)
Constant Temperature Bath (CTB)
Cooler (CLR)
Cooling Coil (CCL)
Evaporator (EVP)
Heat Exchanger (HEX)
Heating Coil (HCL)
Pressure Building Coil (COL)
Vaporizer (VPR)

Heaters

Heating Coil (HCL)
Heater (HTR)

Piping

Collector (COLL)
Condensing Chamber (CND)
Condensing Pot (CPOT)
Pipe Spool (SPPC)
Silencer in Air Conditioning System (SLN)
Steam Line Pot (MCP)
Tank Vent (VENT)

Strainers

Air Separator (AS)
Debris Screen (SCN)
Filter (FLT)
Separator (SEP)
Strainer (STN)
Trap (TRP)

Tanks

Accumulator (ACC)
Cylinder (CYL)
Dryer (DRYG)
Expansion Tank (XTK)
Fluid Drive (FLDR)
Hot Water Generator (HTR)
Reservoir (RVR)
Tank (TNK)
Temperature Control Manifold (MANF)

Tubing

Heater (HTR)

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

BFN made the determination of structures within the scope of license renewal by initially identifying all BFN structures and then reviewing them to determine which satisfy one or more criteria contained in 10 CFR 54.4. This process is described in Section **2.1** and the results of the structures review is contained in this section. Section **2.1** also provides the methodology for determining the components within the scope of 10 CFR 54.4 that meet the requirements contained in 10 CFR 54.21(a)(1). The components that meet these screening requirements are identified in this section. These identified components require an AMR for license renewal.

There are no BFN structures that align with the following NUREG-1801 Volume 2 item numbers:

NUREG-1801 Item	Description
II.A	Pressurized Water Reactor Containment
II.B.2	Boiling Water Reactor Mark II Containment
II.B.3	Boiling Water Reactor Mark III Containment
III.A.1	Class 1 Group 1 Structures – Boiling Water Reactor Building
III.A.7	Class 1 Group 7 Structures - Concrete Tanks

NUREG-1801 Volume 2 III.A.4 (Containment Internal Structures) component evaluation results are presented in Section **2.4.1.1**. NUREG-1801 Volume 2 III.A.5 (fuel storage facility, refueling channel) component evaluation results are presented in Section **2.4.2.1**.

The scoping and screening results for the following structures are described in this subsection:

Section	Structure Name
2.4.1	**Boiling Water Reactor Containment Structures - NUREG-1801 Item II.B**
2.4.1.1	Primary Containment Structure
2.4.2	**Class 1 Group 2 Structures - NUREG-1801 Item III.A2**
2.4.2.1	Reactor Buildings
2.4.2.2	Equipment Access Lock
2.4.3	**Class 1 Group 3 Structures - NUREG-1801 Item III.A3**
2.4.3.1	Diesel Generator Buildings
2.4.3.2	Standby Gas Treatment Building
2.4.3.3	Off-Gas Treatment Building
2.4.3.4	Vacuum Pipe Building
2.4.3.5	Residual Heat Removal Service Water Tunnels
2.4.3.6	Electrical Cable Tunnel from Intake Pumping Station to the Powerhouse
2.4.3.7	Underground Concrete Encased Structures
2.4.3.8	Earth Berm
2.4.4	**Class 1 Group 6 Structures - NUREG-1801 Item III.A6**
2.4.4.1	Intake Pumping Station
2.4.4.2	Gate Structure No. 3
2.4.4.3	Intake Channel
2.4.4.4	North Bank of Cool Water Channel East of Gate Structure No. 2
2.4.4.5	South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3
2.4.5	**Class 1 Group 8 Structures - NUREG-1801 Item III.A8**
2.4.5.1	Condensate Water Storage Tanks' Foundations and Trenches
2.4.5.2	Containment Atmosphere Dilution Storage Tanks' Foundations
2.4.6	**Class 1 Group 9 Structures - NUREG-1801 Item III.A9**
2.4.6.1	Reinforced Concrete Chimney
2.4.7	**Non-Class 1 Structures**
2.4.7.1	Turbine Buildings
2.4.7.2	Diesel High Pressure Fire Pump House
2.4.7.3	Vent Vaults
2.4.7.4	Transformer Yard

Section	Structure Name
2.4.7.5	161 kV Switchyard
2.4.7.6	500 kV Switchyard
2.4.8	**Structures and Component Supports Commodities**
2.4.8.1	Structures and Component Supports Commodity Group

2.4.1 Boiling Water Reactor Containment Structures - NUREG-1801 Item No. II.B

2.4.1.1 Primary Containment Structure

Description

The Primary Containment structure is a General Electric Mark I containment design. The primary containment consists of a drywell, pressure suppression chamber and a connecting vent system. The Primary Containment structure for each unit is completely enclosed within the unit's Reactor Building.

The drywell is a steel pressure vessel enclosed in reinforced concrete. The drywell contains the reactor vessel, the reactor recirculation system, and portions of other systems that form the reactor coolant pressure boundary. It also includes structural steel framing, electrical and mechanical equipment and system supports, a concrete shield wall around the reactor vessel, a removable steel head, a personnel airlock with two mechanically interlocked doors, two equipment hatches, and miscellaneous electrical and mechanical penetrations.

The pressure suppression chamber is a steel toroidal shaped pressure vessel. The pressure suppression chamber is commonly known as the torus. The torus includes internal steel framing, vent header, supports, access hatches, and penetrations. The torus is mounted on support structures that transmit loads to the concrete foundation of the Reactor Building.

The drywell is connected to the pressure suppression chamber with eight equally spaced vent lines. These drywell vent lines are connected to a header which is contained within the air space of the pressure suppression chamber. The pressure suppression chamber contains a large pool of water that condenses steam from a failure of reactor coolant pressure boundary piping in the drywell. The pool also condenses steam from main steam relief valve discharge, and high pressure coolant injection and reactor core isolation cooling turbine discharge.

The Primary Containment structure limits the release of fission products to the environs in the event of a design basis loss-of-coolant-accident (LOCA).

The Primary Containment structure is a Class I structure in the scope of 10 CFR 54 because the structure meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	Yes (F.7)	Yes

The Primary Containment System intended functions are:

- Structural Support and Protection - Provides structural support and shelter/protection for components relied upon to demonstrate compliance with EQ (Section **F.4**), FP (Section **F.3**), and ATWS (Section **F.7**) regulated events.
- Structural Support and Protection - Provides structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with the SBO regulated event.
- Primary Containment - Limits and controls the release of fission products to the secondary containment during design basis accidents (LOCA) so that offsite consequences are within acceptable limits.
- Pressure Suppression - Provides sufficient air and water volumes to absorb the energy released to containment during design basis accidents, so that the pressure remains within acceptable limits.
- Water Source - Provides a source of water to the emergency core cooling systems.
- Radiation Shielding - Provides protection to personnel and components from radiation via the sacrificial shield wall between the reactor pressure vessel and the drywell steel liner.

The entire Primary Containment structure contains components requiring an AMR.

USAR References

Additional details for the Primary Containment structure are found in UFSAR **5.2**, **12.2.2** and **C.5**.

License Renewal Drawing(s)

The license renewal drawing for the Primary Containment structure is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.1.1, Primary Containment structure.

The aging management review results for these component types are provided in Table **3.5.2.1**, Primary Containment Structures - Summary of Aging Management Evaluation.

Table 2.4.1.1 Primary Containment Structure

Component Type	Intended Functions
Caulking and Sealants	SP
Compressible Joints & Seals	PB
Controlled Leakage Doors	PB
Hatches/Plugs	PB, SP
High Density Shielding Concrete	SH
Penetrations, Electrical and I&C	PB, SS
Penetrations, Mechanical	PB, SH, SS
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS
Steel Containment Elements	PB, SS
Structural Bellows	PB
Structural Steel Beams, Columns, Plates, Trusses	SS

2.4.2 Class 1 Group 2 Structures - NUREG 1801 Item Number III.A2

The following structures are included in this subsection:

Section	**Structure Name**
2.4.2.1	Reactor Buildings
2.4.2.2	Equipment Access Lock

2.4.2.1 Reactor Buildings

Description

The Reactor Building for each unit completely encloses the reactors, the primary containment structures, and the auxiliary and emergency systems of the nuclear steam supply system. A major sub-structure of the Reactor Building is the reinforced concrete biological shield that surrounds the drywell portion of primary containment. The Reactor Buildings also house features such as the spent fuel pool, steam dryer/moisture separator storage pool, reactor cavity, reactor auxiliary equipment, refueling equipment, reactor servicing equipment, and the Control Bay. The Control Bay houses the main control room for plant operation and other important auxiliary systems required for plant operation. The Reactor Building consists of monolithic reinforced concrete floors and walls from its foundation to the refueling floor. The refueling floor, which is common for all three units, is enclosed by the steel superstructure with metal siding and a built-up roof. Blowout or pressure relief panels are installed as part of the Reactor Building superstructure metal siding to relieve pressure during a DBA or DBE.

The Reactor Building is a Class I structure and is in the scope of 10 CFR 54 because the structure contains components that meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (**F.3**)	Yes (**F.4**)	Yes (**F.7**)	Yes

The Reactor Buildings intended functions are:

- Provides controls for the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. The Reactor Building provides secondary containment function when the primary containment is required to be in service, and provides primary containment function during reactor refueling and maintenance operations when the primary containment systems are open.
- Provides radiation shielding protection for personnel and equipment/components.
- Provides structural support and shelter/protection for components relied upon to demonstrate compliance with FP (Section **F.3**), EQ (Section **F.4**), and ATWS (Section **F.7**) regulated events.
- Provides structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with the SBO regulated event.
- Provides protection for safe storage of new and spent fuel.

UFSAR Reference

Additional details for the Reactor Building structure are found in UFSAR **5.3**, **12.2.2**, **F.7.1**, **F.7.2**, **F.7.3**, and in the FPR FHA 6.0.

License Renewal Drawing(s)

The license renewal drawing for the Reactor Building is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.2.1, Reactor Building Structure.

The aging management review results for these component types are provided in Table **3.5.2.2**, Reactor Buildings - Summary of Aging Management Evaluation.

Table 2.4.2.1 Reactor Building Structure

Component Type	Intended Functions
Bolting & Fasteners	SS, PB
Caulking & Sealants	FLB, PB
Compressible Joints and Seals	FLB, PB
Controlled Leakage Doors	FLB, PB, SP, HE/ME
Expansion Joints	ES/SEP
Fire Barriers	FB
Hatches & Plugs	SP, SS
Masonry Block	SS, SS(NSR)
Metal Roofing	PB, SS
Metal Siding	PB, SP
Penetrations Electrical and I&C	SS, SS(NSR)
Penetrations Mechanical	SS, SS(NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS
Roof Membrane	SP
Spent Fuel Pool Liners	PB
Spent Fuel Storage Racks (includes new fuel storage racks)	CC, SS
Structural Steel, Beams, Plates and Trusses	SS

2.4.2.2 Equipment Access Lock

Description

The Equipment Access Lock is a shared feature for all three Reactor Buildings. It is a reinforced concrete structure, supported on piles, located on the south end of the Unit 1 Reactor Building. The structure is sized to allow the passage of a railcar or a tractor trailer within and provides for the transit of large equipment into or out of the Reactor Buildings while maintaining secondary containment. The Equipment Access Lock is an airlock with large equipment doors that open to the outside environment on the south end and access to the Unit 1 Reactor Building on the north end.

The Equipment Access Lock is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Equipment Access Lock intended functions are:

- Provides controls for the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits.
- Provides secondary containment envelope between the Reactor Building and the outside entrance to minimize radiological consequences.
- Provide structural support and shelter/protection for safety-related components and nonsafety-related components.

The entire structure contains components requiring an AMR.

UFSAR References

Additional descriptive information for the Equipment Access Lock is found in UFSAR **5.3.3.5** and **12.2.9**.

License Renewal Drawings

The license renewal drawing for the Equipment Access Lock is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.2.2, Equipment Access Lock.

The aging management review results for these component types are provided in Table **3.5.2.3**, Equipment Access Lock - Summary of Aging Management Evaluation.

Table 2.4.2.2 Equipment Access Lock

Component Type	Intended Functions
Caulking and Sealants	FLB, PB
Compressible Joints and Seals	FLB, PB
Controlled Leakage Doors	FLB, PB, SP
Penetrations, Electrical and I&C	SP, SS, SS(NSR)
Penetrations, Mechanical	SS, SS(NSR)
Piles	SS
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB, FLB, MB, SP, SS
Structural Steel Beams, Columns, Plates, and Trusses	SS

2.4.3 Class 1 Group 3 Structures - NUREG-1801 Item III.A3

The following structures are included in this subsection:

Section	Structure Name
2.4.3.1	Diesel Generator Buildings
2.4.3.2	Standby Gas Treatment Building
2.4.3.3	Off-Gas Treatment Building
2.4.3.4	Vacuum Pipe Building
2.4.3.5	Residual Heat Removal Service Water Tunnels
2.4.3.6	Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse
2.4.3.7	Underground Concrete Encased Structures
2.4.3.8	Earth Berm

2.4.3.1 Diesel Generator Buildings

Description

The Diesel Generator Buildings provide structural support and shelter/protection for the diesel generators and other in-scope components that are essential for safe shutdown in the event of a sustained loss of offsite power. The Units 1 & 2 Diesel Generator Building houses four diesel generators that provide power to the four shared Unit 1 & 2 shutdown boards located in the Reactor Buildings. The Unit 3 Diesel Generator Building houses four diesel generators that provide power to the four separate Unit 3 shutdown boards located in Unit 3 Diesel Generator Building.

The Diesel Generator Buildings are Class I structures and are in the scope of 10 CFR 54 because they meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	No	No	Yes

The Diesel Generator Buildings intended functions are:

- Provide structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with FP and SBO regulated events.

The entire structures contain components requiring an AMR.

UFSAR References

Additional details for the Diesel Generator Buildings are found in UFSAR **8.5**, **12.2.8**, **12.2.13**, **F.7.6** and in the FPR FHA 6.0.

License Renewal Drawings

The license renewal drawing for the Diesel Generator Buildings is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.1, Diesel Generator Buildings.

The aging management review results for these component types are provided in Table **3.5.2.5**, Diesel Generator Buildings - Summary of Aging Management Evaluation.

Table 2.4.3.1 Diesel Generator Buildings

Component Type	Intended Function
Caulking and Sealants	FLB, PB
Compressible Joints and Seals	FLB
Controlled Leakage Doors	FLB, MB, SP
Fire Barriers	FB
Hatches/Plugs	SP, SS
Masonry Block	SS(NSR)
Metal Siding	PB, SP
Penetrations, Electrical and I&C	SS, SS(NSR)
Penetrations, Mechanical	SS, SS(NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS
Structural Steel Beams, Columns, Plates and Trusses	FLB, SS, SS(NSR)

2.4.3.2 Standby Gas Treatment Building

System Description

The Standby Gas Treatment (SGT) Building provides a protected environment for the SGT System. The SGT Building houses shared components for all three units. The SGT Building consists of two double-barreled reinforced concrete box frame structures with closed ends. The two structures are located side-by-side adjacent to the south west corner of the Unit 1 Reactor Building and lie within the Earth Berm. One structure houses two of the three SGT trains. The other structure houses the third SGT train.

The SGT Building is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The SGT Building intended functions are:

- Provide structural support and shelter/protection for safety-related and nonsafety-related components.

The entire structure contains components requiring an AMR.

UFSAR References

Additional details for the SGT Building are found in UFSAR **5.3**, **12.2.10**, and **F.7.8**.

License Renewal Drawings

The license renewal drawing for the SGT Building is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.2, Standby Gas Treatment Building.

The aging management review results for these component types are provided in Table **3.5.2.6**, Standby Gas Treatment Building - Summary of Aging Management Evaluation.

Table 2.4.3.2 Standby Gas Treatment Building

Component Type	Intended Functions
Penetrations, Electrical and I&C	SP, SS, SS(NSR)
Penetrations, Mechanical	SS, SS(NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS

2.4.3.3 Off-Gas Treatment Building

Description

The Off-Gas Treatment Building is an underground structure that houses the Off-Gas System charcoal adsorbers and supporting equipment for all three units. The exterior walls and bottom slab are designed and constructed to maintain their structural integrity during a partial collapse of the Reinforced Concrete Chimney during an external event (seismic, tornadic, etc.) so that they will not permit water leakage into or out of the building below elevation 566.25 feet.

The Off-Gas Treatment Building is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Off-Gas Treatment Building intended functions are:

- Prevent release of radiation from failure/collapse of activated charcoal beds into surrounding groundwater.

The portions of the Off-Gas Treatment Building that contain components requiring an AMR include the exterior walls and bottom slab.

UFSAR Reference

Additional detail for the Off-Gas Treatment Building is found in UFSAR **12.2.14**.

License Renewal Drawings

The license renewal drawing for the Off-Gas Treatment Building is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.3, Off-Gas Treatment Building.

The aging management review results for these component types are provided in Table **3.5.2.7**, Off-Gas Treatment Building - Summary of Aging Management Evaluation.

Table 2.4.3.3 Off-Gas Treatment Building

Component Type	Intended Functions
Caulking and Sealants	PB
Penetrations, Mechanical	PB
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB

2.4.3.4 Vacuum Pipe Building

Description

The Vacuum Pipe Building is an underground structure that provides structural support and shelter/protection for the condenser circulating water system vacuum breaker components that prevent backflow from the warm water channel to the intake channel. This ensures that maximum temperature analysis assumptions for accident cooling systems are maintained during accidents and events. The Vacuum Pipe Building is a shared feature for all three units.

The Vacuum Pipe Building is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Vacuum Pipe Building intended functions are:

- Provide structural support and shelter/protection for safety-related and nonsafety-related components.

The entire structure contains components requiring an AMR.

UFSAR References

Additional detail information for the Vacuum Pipe Building is found in UFSAR **12.2.7.8.3**.

License Renewal Drawings

The license renewal drawing for the Vacuum Pipe Building is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.4, Vacuum Pipe Building.

The aging management review results for these component types are provided in Table **3.5.2.8**, Vacuum Pipe Building - Summary of Aging Management Evaluation.

Table 2.4.3.4 Vacuum Pipe Building

Component Types	Intended Functions
Hatches and Plugs	SP
Penetrations, Electrical and I&C	SS(NSR)
Penetrations, Mechanical	SS, SS(NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS

2.4.3.5 Residual Heat Removal Service Water Tunnels

Description

The Residual Heat Removal Service Water (RHRSW) Tunnels are underground multi-plate arch tunnels that protect safety-related piping systems (i.e. RHRSW and Emergency Equipment Cooling Water (EECW) supply and discharge piping) that penetrate the south wall of the Reactor Building until they are buried below grade near the south end of the tunnel.

The RHRSW Tunnels are in the scope of 10 CFR 54 because the meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	Yes	Yes	No	No	No

The RHRSW Tunnels intended functions are:

- Provide structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with the FP regulated event.

The entire structure contains components requiring an AMR.

UFSAR References

The RHRSW Tunnels are not described in the UFSAR.

License Renewal Drawings

The license renewal drawing for the RHRSW Tunnels is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.5, Residual Heat Removal Service Water Tunnels.

The aging management review results for these component types are provided in Table **3.5.2.9**, Residual Heat Removal Service Water Tunnels - Summary of Aging Management Evaluation.

Table 2.4.3.5 Residual Heat Removal Service Water Tunnels

Component Type	Intended Functions
Compressible Joints & Seals	DP, SP
Penetrations - Electrical and I&C	SP, SS(NSR)
Piles	SS(NSR)
Tunnels	SP, SS(NSR)

2.4.3.6 Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse

Description

The Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse is an underground concrete-encased tunnel that provides structural support and shelter/protection for the power cables for components (including the RHRSW System, EECW System, and the electric fire pumps) in the Intake Pumping Station. The tunnel also runs east-west under the southern portion of the Turbine Buildings.

The Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	No	No	No

The Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse intended functions are:

- Provide structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with the FP regulated event.

The entire structure contains components requiring an AMR.

UFSAR References

The Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse is not described in the UFSAR.

License Renewal Drawings

The license renewal drawing for the Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.6, Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse.

The aging management review results for these component types are provided in Table **3.5.2.10**, Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse - Summary of Aging Management Evaluation.

Table 2.4.3.6 Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse

Component Types	Intended Functions
Fire Barrier	FB
Penetrations, Electrical and I&C	SP, SS
Tunnels	SP, SS

2.4.3.7 Underground Concrete Encased Structures

Description

The Underground Concrete Encased Structures include safety-related manholes, handholes and duct banks that span between safety-related structures, manholes and handholes. This group of structures also includes those manholes, handholes, and duct banks required for SBO.

The Underground Concrete Encased Structures are in the scope of 10 CFR 54 because they meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	No	No	Yes

The Underground Concrete Encased Structures intended functions are:

- Provide structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with FP and SBO regulated events.

The entire structure contains components requiring an AMR.

UFSAR References

Underground Concrete Encased Structures are not described in the UFSAR.

License Renewal Drawings

The license renewal drawing for the Underground Concrete Encased Structures is listed below:

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.7, Underground Concrete Encased Structures.

The aging management review results for these component types are provided in Table **3.5.2.11**, Underground Concrete Encased Structures - Summary of Aging Management Evaluation.

Table 2.4.3.7 Underground Concrete Encased Structures

Component Type	Intended Functions
Caulking and Sealants	FLB, SP
Duct Banks, Manholes	SP, SS
Penetrations, Electrical and I&C	SP, SS, SS(NSR)
Penetrations, Mechanical	SS, SS(NSR)

2.4.3.8 Earth Berm

Description

The Earth Berm extends along the west, south, and east walls of the Reactor Building from the Unit 1 Diesel Generator Building to the Unit 3 Diesel Generator Building. The Earth Berm has the following structures located within it: Equipment Access Lock, the RHRSW Tunnels, Vent Vaults, and Standby Gas Treatment (SGT) Building. The Earth Berm is a plant feature common to all three units.

The Earth Berm is classified as a safety-related earthen embankment and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	No	No	No	No

The Earth Berm intended functions are:

- Provide structural support for in-scope structures/features.

The entire structure contains components requiring an AMR.

UFSAR References

Additional descriptive information for the Earth Berm structure is found in UFSAR 12.2.9 and 12.2.10.

License Renewal Drawings

The license renewal drawing for the Earth Berm is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.3.8, Earth Berm.

The aging management review results for these component types are provided in Table 3.5.2.4, Earth Berm - Summary of Aging Management Evaluation.

Table 2.4.3.8 Earth Berm

Component/Commodity	Passive Intended Functions
Intake Canals, Dikes, Embankments	SS

2.4.4 Class 1 Group 6 Structures - NUREG-1801 Item III.A6

The following structures are included in this subsection:

Section	Structure Name
2.4.4.1	Intake Pumping Station
2.4.4.2	Gate Structure No. 3
2.4.4.3	Intake Channel
2.4.4.4	North Bank of Cool Water Channel East of Gate Structure No. 2
2.4.4.5	South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 (only that portion above the RHRSW discharge piping)

2.4.4.1 Intake Pumping Station

Description

The Intake Pumping Station is a reinforced concrete structure that provides structural support and/or shelter/protection for the condenser circulating water pumps, the electric fire pumps, and pumps supplying the RHRSW and EECW Systems. The Intake Pumping Station houses components for all three units. The Intake Pumping Station protects safety-related equipment and components such as the pumps supplying the RHRSW and EECW Systems from design basis events (e.g., earthquakes, flooding, tornadoes).

The Intake Pumping Station is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes	No	No	Yes

The Intake Pumping Station intended functions are:

- Provide structural support and shelter/protection for safety-related components, nonsafety-related components, and components relied upon to demonstrate compliance with FP, and SBO regulated events.

The entire Intake Pumping Station contains components that require an AMR.

UFSAR References

Additional details for the Intake Pumping Station are found in UFSAR **12.2.7**, **12.2.16**, and **F.7.7**.

License Renewal Drawings

The license renewal drawing for the Intake Pumping Station is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.4.1, Intake Pumping Station.

The aging management review results for these component types are provided in Table **3.5.2.12**, Intake Pumping Station - Summary of Aging Management Evaluation.

Table 2.4.4.1 Intake Pumping Station

Component Type	Intended Functions
Caulking and Sealants,	FLB, SP
Compressible Joints and Seals	FLB, SP
Controlled Leakage Doors	FLB, SP, SS
Fire Barriers	FB
Masonry Block	SS(NSR)
Penetrations, Electrical and I&C	SP, SS, SS(NSR)
Penetrations, Mechanical	SS, SS(NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)

2.4.4.2 Gate Structure No. 3

Description

Gate Structure No. 3 acts as a skimmer wall for cooling water drawn from Wheeler Reservoir into the plant. Gate Structure No. 3 is designed so that a sufficient flow of water from Wheeler Reservoir is provided to the Intake Channel to supply the RHRSW System and the EECW System. Gate Structure No. 3 is a common structure for all three units. Gate Structure No. 3 is located at the south-east end of the plant, below the Intake Pumping Station and Intake Channel.

Gate Structure No. 3 is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The Gate Structure No. 3 intended functions are:

- Ensure a source of cooling water to safety-related components.
- Ensures a source of water to components relied upon to demonstrate compliance with FP and SBO regulated events.

The entire structure contains components requiring an AMR.

UFSAR References

Additional details for Gate Structure No. 3 are found in UFSAR **11.6** and **12.2.7**.

License Renewal Drawings

The license renewal drawing for the Gate Structure No. 3 is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.4.2, Gate Structure No. 3.

The aging management review results for these component types are provided in Table **3.5.2.13**, Gate Structure No. 3 - Summary of Aging Management Evaluation.

Table 2.4.4.2 Gate Structure No. 3

Component Type	Intended Function
Piles	FD, SS
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS
Structural Steel Beams, Columns, Plates, Trusses	SS

2.4.4.3 Intake Channel

Description

The Intake Channel provides:

- A source of water to the condenser circulating water system and other plant cooling systems during normal operation.
- Source of cooling water post-transient and post-accident for decay heat removal, containment cooling, spent fuel cooling, control bay cooling, essential equipment cooling, and fire protection.
- Sufficient flow and heat sink capacity to maintain safe shutdown following a failure of the downstream Wheeler Dam.

The Intake Channel is common to all three units. The Intake Channel is an excavated channel that extends from the Intake Pumping Station into the river channel that would exist if the Wheeler Dam failed.

The Intake Channel is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The Intake Channel intended functions are:

- Ensure a source of cooling water to safety-related components.
- Ensures a source of water to components relied upon to demonstrate compliance with FP and SBO regulated events.

The entire structure contains components requiring an AMR.

UFSAR References

Additional details for the Intake Channel are found in UFSAR **2.4.2, 12.2.7** and **F.7.7**.

License Renewal Drawings

The license renewal drawing for the Intake Channel listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.4.3, Intake Channel.

The aging management review results for these component types are provided in Table **3.5.2.14**, Intake Channel - Summary of Aging Management Evaluation.

Table 2.4.4.3 Intake Channel

Component/Commodity	Intended Functions
Intake Canals, Dikes, Embankments	SCW, SS

2.4.4.4 North Bank of the Cool Water Channel East of Gate Structure No. 2

Description

The North Bank of Cool Water Channel East of Gate Structure No. 2 is an earthen embankment on the north side of the cool water channel and south of the Reactor Buildings. The bank is a safety-related earthen structure with the sloped portion of the bank protected with vegetation and rock rip-rap. The bank is designed to protect the buried RHRSW System discharge piping located within the bank that discharges into Wheeler Reservoir.

The North Bank of Cool Water Channel East of Gate Structure No. 2 is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The North Bank of Cool Water Channel East of Gate Structure No. 2 intended functions are:

- Provide structural support of buried safety-related components (piping) and components relied upon to demonstrate compliance with FP and SBO regulated events.

The entire structure contains components requiring an AMR.

UFSAR References

Additional detail for the North Bank of Cool Water Channel East of Gate Structure No. 2 is found in UFSAR **12.2.7**.

License Renewal Drawings

The license renewal drawing for the North Bank of Cool Water Channel East of Gate Structure No. 2 is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.4.4, North Bank of Cool Water Channel East of Gate Structure No. 2.

The aging management review results for these component types are provided in Table **3.5.2.15**, North Bank of Cool Water Channel East of Gate Structure No. 2 - Summary of Aging Management Evaluation.

Table 2.4.4.4 North Bank of Cool Water Channel East of Gate Structure No. 2

Component Type	Intended Functions
Intake Canals, Dikes, Embankments	SS

2.4.4.5 South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3

Description

The South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 is an earthen dike on the south side of the cool water channel and the north side forms a boundary with Wheeler Reservoir. The dike is a safety-related earthen structure with the sloped portion of the dike protected with vegetation and rock rip-rap. The dike is designed to protect the buried RHRSW System discharge piping located within the dike that discharges into Wheeler Reservoir.

The South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 intended functions are:

- Provide structural support of buried safety-related components (piping) and components relied upon to demonstrate compliance with FP and SBO regulated events.

The portion of the structure that contains components requiring an AMR is the portion above the RHRSW System discharge piping.

UFSAR References

Additional detail for the South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 is found in UFSAR **12.2.7**.

License Renewal Drawings

The license renewal drawing for the South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.4.5, South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3.

The aging management review results for these components are provided in Table **3.5.2.16,** South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3 - Summary of Aging Management Evaluation.

Table 2.4.4.5 South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3

Component/Commodity	Passive Intended Functions
Intake Canals, Dikes, Embankments	SS

2.4.5 Class 1 Group 8 Structures - NUREG-1801 Item III.A8

The following structures are included in this subsection:

Section	Structure Name
2.4.5.1	Condensate Water Storage Tanks' Foundations and Trenches
2.4.5.2	Containment Atmosphere Dilution Storage Tanks' Foundations

2.4.5.1 Condensate Water Storage Tanks' Foundations and Trenches

Description

The Condensate Water Storage Tanks' Foundations and Trenches are concrete structures that provide structural support to ensure that the Condensate Water Storage Tanks (Section **2.3.4.2**) can:

- Provide a source of water makeup to the condenser hotwells and the Control Rod Drive Hydraulic System during normal operations.
- Provide high purity water for miscellaneous makeup uses throughout the plant (e.g., demineralizer backwash, spent fuel pool makeup).
- Provide a source of clean water to the HPCI and RCIC Systems when required for test and for reactor vessel makeup during accidents and regulated events.
- Provide a source of clean water to the Core Spray Systems when required for test.

The Condensate Water Storage Tanks' Foundations and Trenches is a shared feature for all three units. There are five 500,000 gallon capacity tanks supported on reinforced concrete ring foundations or reinforced concrete slab on grade with a sand bed. Only Condensate Water Storage Tank Nos. 1, 2, and 3 are in scope for license renewal. Therefore, the foundations, trenches, and components for Condensate Water Storage Tank Nos. 1, 2, and 3 are in scope for license renewal.

The Condensate Water Storage Tanks' Foundations and Trenches are in the scope of 10 CFR 54 because they meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	No	Yes	No	No	Yes

The Condensate Water Storage Tanks' Foundations and Trenches intended functions are:

- Provide physical support and shelter/protection for components relied upon to demonstrate compliance with FP and SBO regulated events.

The foundations and trenches for the three Condensate Water Storage Tanks, that provide the normal water supply to the units, contain components requiring an AMR.

UFSAR References

Additional details for the Condensate Water Storage Tanks' Foundations and Trenches are found in UFSAR **11.9** and **F.6.10**.

License Renewal Drawings

The license renewal drawing for the Condensate Water Storage Tanks' Foundations and Trenches is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.5.1, Condensate Water Storage Tanks' Foundations and Trenches.

The aging management review results for these component types are provided in Table **3.5.2.17**, Condensate Water Storage Tanks' Foundations and Trenches - Summary of Aging Management Evaluation.

Table 2.4.5.1 Condensate Water Storage Tanks' Foundations and Trenches

Component Types	Intended Functions
Equipment Supports & Foundations	SS (NSR)
Penetrations, Electrical and I&C	SP, SS (NSR)
Penetrations, Mechanical	SS (NSR)
Structural Steel Beams, Columns, Plates, Trusses	SS (NSR)
Trenches	SP, SS (NSR)

2.4.5.2 Containment Atmosphere Dilution Storage Tanks' Foundations

Description

The Containment Atmosphere Dilution (CAD) System Storage Tanks' Foundations are reinforced concrete slabs on grade or foundations that provide structural support for the tanks that the CAD System uses to control the concentration of combustible gases in the primary containment after an accident and to provide a backup pneumatic supply to selected components when the Control Air System is not available.

The CAD Storage Tanks' Foundations are in the scope of 10 CFR 54 because they meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	No	Yes	No	No	Yes

The CAD Storage Tanks' Foundations intended functions are:

- Provide structural support for safety-related components and components relied upon to demonstrate compliance with FP and SBO regulated events

The entire structure contains components requiring an AMR.

UFSAR References

The CAD Storage Tanks' Foundations are not described in the UFSAR. Additional detail for CAD Storage Tanks is found in UFSAR **5.2.6**.

License Renewal Drawings

The license renewal drawing for the CAD Storage Tanks' Foundations is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.5.2, Containment Atmosphere Dilution Storage Tanks' Foundations.

The aging management review results for these components are provided in Table **3.5.2.18,** Containment Atmosphere Dilution Storage Tanks' Foundations - Summary of Aging Management Evaluation.

Table 2.4.5.2 Containment Atmosphere Dilution Storage Tanks' Foundations

Component Types	Intended Function
Equipment Supports & Foundations	SS

2.4.6 Class 1 Group 9 Structures - NUREG-1801 Item III.A9

2.4.6.1 Reinforced Concrete Chimney

Description

The Reinforced Concrete Chimney provides an elevated release point for radioactive gases from the:

- Gaseous radwaste processing systems during normal plant operations.
- Standby Gas Treatment System during secondary containment isolation and during primary containment venting.
- Hardened Wetwell Vent Systems following a design basis accident (Section **F.9**).

The Reinforced Concrete Chimney is a single structure that serves all three units. The Reinforced Concrete Chimney is a 600 foot high Class I structure designed so that Class I structures (with the exception of the Off-Gas Treatment building) will not be damaged during design basis events.

The Reinforced Concrete Chimney is a Class I structure and is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	No	No	No	No

The Reinforced Concrete Chimney intended functions are:

- Provide structural support and shelter/protection for safety-related and nonsafety-related components

The entire structure contains components requiring an AMR.

UFSAR References

Additional details for the Reinforced Concrete Chimney are found in UFSAR **12.2.4** and **F.7.14**.

License Renewal Drawings

The license renewal drawing for the Reinforced Concrete Chimney is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.6.1, Reinforced Concrete Chimney

The aging management review results for these components are provided in Table **3.5.2.19**, Reinforced Concrete Chimney - Summary of Aging Management Evaluation.

Table 2.4.6.1 Reinforced Concrete Chimney

Component Type	Intended Functions
Hatches and Plugs	SP
Metal Roofing	SS
Penetrations - Electrical and I&C	SS(NSR)
Penetrations - Mechanical	SS(NSR), SS
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS
Roofing Membrane	SP
Structural Steel Beams, Columns, Plates, and Trusses	SS

2.4.7 Non-Class 1 Structures

The following structures are included in this subsection:

Section	**Structure Name**
2.4.7.1	Turbine Buildings
2.4.7.2	Diesel High Pressure Fire Pump House
2.4.7.3	Vent Vault
2.4.7.4	Transformer Yard
2.4.7.5	161 kV Switchyard
2.4.7.6	500 kV Switchyard

2.4.7.1 Turbine Buildings

Description

The Turbine Buildings are a common Class II structure consisting of a reinforced concrete structure with a steel superstructure. The buildings are compartmentalized with the primary consideration for the design of the walls being radiation shielding.

The Turbine Buildings provide:

- Structural support and shelter/protection for components required for safe shutdown following station blackout.
- Structural support and shelter/protection for components required for safe shutdown following fires (Section **F.3**).
- Structural support and shelter/protection for the outboard main steam isolation valves leakage pathway to condenser (Section **F.1**).

The Turbine Buildings are in the scope of 10 CFR 54 because they meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	Yes	Yes (**F.3**)	No	No	Yes

The Turbine Buildings intended functions are:

- Provides structural support and shelter/protection for the outboard main steam isolation valves leakage pathway to condenser (Section **F.1**)
- Not adversely impact other Class I structures as a result of a Design Basis Event
- Provides structural support and shelter/protection for components relied upon to demonstrate compliance with the SBO regulated event
- Provides structural support and shelter/protection for components relied upon to demonstrate compliance with the FP (Section **F.3**) regulated event

The portions of the Turbine Building that contain components requiring an AMR include the entire structure.

UFSAR References

Additional details for the Turbine Buildings structure are found in UFSAR **12.2.3** and **F.6.14**.

License Renewal Drawings

The license renewal drawing for the Turbine Buildings is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.7.1, Turbine Buildings.

The aging management review results for these component types are provided in Table **3.5.2.20**, Turbine Buildings - Summary of Aging Management Evaluation.

Table 2.4.7.1 Turbine Buildings

Component Type	Intended Functions
Hatches/Plugs (Section **F.1**)	SS(NSR)
Metal Roofing	SS(NSR)
Masonry Block*	SS(NSR)
Penetrations, Electrical and I&C	SP, SS(NSR)
Penetrations, Mechanical	SS(NSR)
Piles	SS(NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)
Roof Membrane	SP
Structural Steel Beams, Columns, Plates, and Trusses	SS(NSR)

* Masonry block is a component type identified for Unit 2 only. Masonry block utilized for Units 1 and 3 is not in scope for period of extended operation.

2.4.7.2 Diesel High Pressure Fire Pump House

Description

The Diesel High Pressure Fire Pump House provides structural support and shelter/protection for the diesel high pressure fire pump. The Diesel High Pressure Fire Pump House is a shared structure for all three units.

The Diesel High Pressure Fire Pump House is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	No	Yes	No	No	No

Diesel High Pressure Fire Pump House intended functions are:

- Provide structural support and shelter/protection for components relied upon to demonstrate compliance with FP

The entire structure contains components requiring an AMR.

UFSAR References

The Diesel High Pressure Fire Pump House is not described in the UFSAR. Additional details for the Diesel High Pressure Fire Pump is found in FPR 4.4.1.

License Renewal Drawings

The license renewal drawing for the Diesel High Pressure Fire Pump House is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.7.2, Diesel High Pressure Fire Pump House

The aging management review results for these component types are provided in Table **3.5.2.21**, Diesel High Pressure Fire Pump House - Summary of Aging Management Evaluation.

Table 2.4.7.2 Diesel High Pressure Fire Pump House

Component Types	Intended Functions
Metal Roofing	SS (NSR)
Metal Siding	SP
Penetrations Electrical and I&C	SP, SS (NSR)
Penetrations Mechanical	SS (NSR)
Piles	SS (NSR)
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS (NSR)
Roof Membrane	SP
Structural Steel Beams, Columns, Plates, Trusses	SS (NSR), DP

2.4.7.3 Vent Vaults

Description

A Vent Vault is provided for each unit. Each Vent Vault is an open-top concrete structure with its base foundation founded on compacted backfill located within the Earth Berm adjacent to its associated Reactor Building. The Vent Vaults contain components required for the Reactor Building Ventilation System supply, including the secondary containment isolation dampers.

The Vent Vaults are in the scope of 10 CFR 54 because they meet the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	Yes	No	No	No	No

The Vent Vaults intended functions are:

- Provide structural support for safety-related components

The portions of the Vent Vaults that contain components requiring an aging management review include the east and west walls and the floor slab.

UFSAR References

None

License Renewal Drawings

The license renewal drawing for the Vent Vaults is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.7.3, Vent Vaults.

The aging management review results for these component types are provided in Table 3.5.2.22, Vent Vaults - Summary of Aging Management Evaluation.

Table 2.4.7.3 Vent Vaults

Component Types	Intended Functions
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)

2.4.7.4 Transformer Yard

Description

The Transformer Yard is a shared feature for all three units. The Transformer Yard supports components required for power restoration following a station blackout.

The Transformer Yard is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	No	No	No	No	Yes

The Transformer Yard intended functions are:

- Provide structural support for components relied upon to demonstrate compliance with the SBO regulated event

The entire structure contains components requiring an AMR.

UFSAR References

Additional detail of the Transformer Yard is found in the UFSAR **8.2**, **8.4**, and **8.10**.

License Renewal Drawings

The license renewal drawing for the Transformer Yard is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.7.4, Transformer Yard.

The aging management review results for these component types are provided in Table **3.5.2.23**, Transformer Yard - Summary of Aging Management Evaluation.

Table 2.4.7.4 Transformer Yard

Component Types	Intended Functions
Piles	SS (NSR)
Structural Steel Beams, Columns, Plates, Trusses	SS (NSR)

2.4.7.5 161 kV Switchyard

Description

The 161 kV Switchyard is a shared feature for all three units. The switchyard routes power from off-site transmission lines into BFN for on-site use. The 161 kV Switchyard supports components required for power restoration following a station blackout.

The 161 kV Switchyard is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	No	No	No	No	Yes

The 161 kV Switchyard intended functions are:

- Provide structural support and shelter/protection for components relied upon to demonstrate compliance with the SBO regulated event

The entire structure contains components requiring an AMR.

UFSAR References

Additional detail of the 161 kV Switchyard is found in the UFSAR **1.5**, **1.6**, **8.1**, **8.3**, **8.4**, and **8.10**.

License Renewal Drawings

The license renewal drawing for the 161 kV Switchyard is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.7.5, 161 kV Switchyard.

The aging management review results for these component types are provided in Table **3.5.2.24**, 161 kV Switchyard - Summary of Aging Management Evaluation.

Table 2.4.7.5 161 kV Switchyard

Component Types	Intended Functions
Structural Steel Beams, Columns, Plates, Trusses	SS (NSR)
Tunnels	SP, SS (NSR)

2.4.7.6 500 kV Switchyard

Description

The 500 kV Switchyard is a shared feature for all three units. The 500 kV switchyard routes power to off-site transmission lines and can be used to route power into BFN for on-site use. The 500 kV Switchyard supports components required for power restoration following a station blackout.

The 500 kV Switchyard is in the scope of 10 CFR 54 because it meets the following criteria of 10 CFR 54.4.

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
No	No	No	No	No	Yes

The 500 kV Switchyard intended functions are:

- Provide structural support and shelter/protection for components relied upon to demonstrate compliance with the SBO regulated event

The entire structure contains components requiring an AMR.

UFSAR References

Additional detail of the 500 kV Switchyard is found in the UFSAR **1.5**, **1.6**, **8.1**, **8.3**, **8.4**, and **8.10**.

License Renewal Drawings

The license renewal drawing for the 500 kV Switchyard is listed below.

0-10E201-01-LR

Components Subject to AMR

The component types that require aging management review are indicated in Table 2.4.7.6, 500 kV Switchyard.

The aging management review results for these component types are provided in Table **3.5.2.25**, 500 kV Switchyard - Summary of Aging Management Evaluation.

Table 2.4.7.6 500 kV Switchyard

Component Types	Intended Functions
Structural Steel Beams, Columns, Plates, Trusses	SS (NSR)
Tunnels	SP, SS (NSR)

2.4.8 Structures and Component Supports Commodities

2.4.8.1 Structures and Component Supports Commodity Group

This group includes specific types of structure and component support elements located within in-scope structures.

Physical interfaces exist with the structure, system or component being supported and with the building structural element to which the support is anchored. A primary function of a support is to provide anchorage of the supported element for design basis events so the supported element can perform its intended function.

The supports within a structure that are included in the scope of license renewal for BFN are identified under the individual structure's description. The in-scope items include support members, welds, bolted connections, anchorage (including base plate and grout) to the building structure, spring hangers, guides and building concrete at bolt locations. The component supports commodity group includes:

- Supports for ASME Piping and Components (NUREG-1801 Items III.B1):

  This group includes the supports and support anchorage for ASME equivalent code class piping and components, such as pumps and heat exchangers. Components evaluated in this group include support structural members, welds, bolting, anchorage and building concrete at anchorage, etc., that comprise the interface between the structure and the mechanical component.

- Supports for Cable Trays, Conduit, HVAC Ducts, Tube Track, Instrument Tubing and Non-ASME Piping and Components (NUREG-1801 Items III.B2):

  This group includes the supports and support anchorage for cable trays, conduits, HVAC ducts, tube track, instrument tubing, and non-ASME piping and components. Components evaluated in this group include cable tray, conduit, and their structural support members, welds, bolting, anchorage and building concrete at anchorage, etc., that comprise the interface between the structure and the mechanical, electrical, or instrument component.

- Anchorage of Racks, Panels, Cabinets and Enclosures for Electrical Equipment and Instrumentation (NUREG-1801 Items III.B3):

  This group includes the supports and support anchorage for enclosures of various types that contain and support electrical equipment. Components evaluated in this group include support structural members, welds, bolting, anchorage and building concrete at anchorage, etc., that comprise the interface between the structure and the electrical or instrument component.

- Supports for Emergency Diesel Generator, HVAC System Components and Miscellaneous Mechanical Equipment (NUREG-1801 Items III.B4):

  This group includes the supports and support anchorage for equipment not addressed in previous groups, such as the diesel generators and HVAC equipment. Components evaluated in this group include support structural members, welds, bolting, anchorage and building concrete at anchorage, etc., that comprise the interface between the structure and the component.

- Supports for Platforms, Pipe Whip Restraints, Jet Impingement Shields, Masonry Walls and other Miscellaneous Structures (NUREG-1801 Items III.B5):

  This group includes the structure and anchorage for miscellaneous structures as described above that indirectly support operation. For example, a pipe whip restraint does not support a pipe, so it would not be required for a system to function. However, the whip restraint may be required for safety reasons and would therefore be required for operation of the system. Components evaluated in this group include support structural members, welds, bolting, anchorage and building concrete at anchorage, etc., that comprise the evaluated structure and its anchorage.

UFSAR References

Additional detail for pipe whip prevention and jet deflectors (i.e. jet impingement shields) is found in the UFSAR **5.2**.

Additional detail for structural qualification of Class 1 subsystems and components, including piping, pipe supports, major components (i.e. reactor vessel), HVAC ductwork supports, conduit, conduit supports, cable tray systems, and instrument tubing, is found in the UFSAR Appendix **C**.

License Renewal Drawings

None

Components/Commodities Requiring AMR

The component types that require aging management review are indicated in Table 2.4.8.1, Structures and Component Supports.

The aging management review results for these component types are provided in Table **3.5.2.26**, Structures and Component Supports - Summary of Aging Management Evaluation.

Table 2.4.8.1 - Structures and Component Supports

Component Type	Intended Functions
ASME Equivalent Supports and Components	SS
Bolting and Fasteners	PB, SS
Cable Trays and Supports	SS, and/or SS(NSR)
Conduit and Supports	SP, SS, and/or SS(NSR)
Duct Banks, Manholes	SS
Electrical Panels, Racks, Cabinets, and Other Enclosures	SP, SS, and/or SS(NSR)
Equipment Supports and Foundations	SS, and/or SS(NSR)
HVAC Duct Supports	SS, and/or SS(NSR)
Instrument Line Supports	SS, and/or SS(NSR)
Instrument Racks, Frames, Panels & Enclosures	SP, SS, and/or SS(NSR)
Non-ASME Equivalent Supports and Components	SS, and/or SS(NSR)
Pipe Whip Restraints and Jet Impingement Shields	PW and/or HE/ME
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS, and/or SS(NSR)
Stairs, Platforms, Grating Supports	SS, and/or SS(NSR)
Trenches	SS(NSR)
Tube Track	SS, and/or SS(NSR)
Tunnels	SS, and/or SS(NSR)

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROLS SYSTEMS

Electrical Systems, Structures, and Components (SSCs) provide power to mechanical systems, Instrumentation and Controls (I&C) systems, and other electrical systems. The I&C SSCs provide instrumentation and control signals for mechanical systems and other electrical systems. The following scoping and screening results are included in this section.

Section	System Name
2.5.1	Electrical and Instrumentation and Control Commodities

2.5.1 Electrical and Instrumentation and Control Commodities

Description

The electrical and I&C systems that are in-scope, because they have intended functions to power and control components meeting 10 CFR 54.4 criteria, are identified in the plant level scoping results described in Section 2.2. However, scoping and screening of electrical and I&C components was performed using the “spaces” approach described in Section 2.1. Therefore, component level scoping was performed by evaluation of commodities, rather than system components.

Electrical Commodities are in the scope of 10 CFR 54 because they contain components that meet the following criteria of 10 CFR 54.4:

(a)(1)	(a)(2)	(a)(3) FP	(a)(3) EQ	(a)(3) ATWS	(a)(3) SBO
Yes	Yes	Yes (F.3)	Yes (F.4)	Yes (F.7)	Yes

The Electrical Commodities meet 10 CFR 54.4(a)(1) because they contain components that must function post-accident to mitigate accidents. The Electrical Commodities meet 10 CFR 54.4(a)(2) because they contain non-safety-related components that are required to ensure the satisfactory performance of safety-related components. The Electrical Commodities meet the requirements of 10 CFR 54.4(a)(3) because they contain components that are:

- Relied upon in plant evaluations to perform a function that demonstrates compliance with 10 CFR 50.49.
- Required for BFN to comply with the safe shutdown during and following fire requirements of 10 CFR 50.48.
- Required for BFN to comply with the anticipated transient without scram requirements of 10 CFR 50.62.
- Required for BFN to comply with the station blackout safe shutdown requirements of 10 CFR 50.63.

UFSAR References

Additional descriptions of Electrical and I&C Commodities are found in UFSAR **Chapter 8** and **Appendix F**.

License Renewal Drawings

The license renewal drawings for Electrical and I&C Commodities depicting the recovery path for SBO are listed below:

0-15E500-1-LR **0-45N500-LR** **3-15E500-3-LR**

System Components/Commodities Requiring AMR

The component types that require aging management review are indicated in Table 2.5.1, Electrical and I&C Commodities.

The aging management review results for these component types are provided in Table **3.6.2.1**, Electrical and I&C Commodities – Summary of Aging Management Evaluation.

Table 2.5.1 Electrical and Instrumentation and Control Commodities

Component Type	Intended Function
Bus (with enclosures), Transmission Conductors, and High-Voltage Insulators (metallic portions)	CE, SS
Bus and High-Voltage Insulators (non-metallic portions)	INS
Electrical cables and connections not subject to 10 CFR 50.49 Environmental Qualification requirements (connections include connectors, splices, terminal blocks, fuse blocks/clips, and electrical/I&C penetration assembly pigtails and connectors)	CE
Various Electrical equipment subject to 10 CFR 50.49 EQ requirements	CE

2.6 REFERENCES FOR CHAPTER 2

1. 10 CFR 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants, U.S. Nuclear Regulatory Commission.
2. NEI 95-10, Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Rev. 3, Nuclear Energy Institute, March 2001.
3. NUREG 1800 Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, U.S. Nuclear Regulatory Commission, July 2001.
4. NUREG-1801, "Generic Aging Lessons Learned Report," Volumes 1 and 2, NRC, July 2001.

3.0 AGING MANAGEMENT REVIEW RESULTS

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. The major sections of this Chapter are:

Table 3.0.1 and Table 3.0.2 provided descriptions of the internal and external service environments, respectively, used in the aging management reviews to determine aging effects requiring management.

Components and structures subject to an aging management review were evaluated to demonstrate that the effects of aging will be managed so that the intended functions will be maintained consistent with the current licensing basis for the period of extended operation. The components, aging effects/mechanism, and aging management programs to be used for managing the effects of aging at Browns Ferry Nuclear Plant (BFN) were compared to those listed in NUREG-1801.

The aging management review results are presented in the following two table formats.

- Table 3.x.1 - where '3' indicates the 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 table would be numbered 3.1.1, in the Engineered Safety Features subsection; this table would be 3.2.1, and so on. For ease of discussion, this table will hereafter be referred to in this Section as "Table 1."

- Table 3.x.2.y - where '3' indicates the 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, for the Reactor Vessel, within the Reactor Coolant System subsection, this table would be 3.1.2.1 and for the Reactor Vessel Internals, it would be table 3.1.2.2. For the Containment system within the Engineered Safety Features subsection, this table would be 3.2.2.1. For the next system within the ESF subsection, it would be table 3.2.2.2. For ease of discussion, this table will hereafter be referred to in this section as "Table 2."

Table Description

NUREG-1801 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 extended period of operation. The evaluation results documented in the report indicate that many of the existing programs are adequate to manage the aging effects for particular structures or components, within the scope of license renewal, without change. The report also contains recommendations on specific areas for which existing programs should be augmented for license renewal. In order to take full advantage of NUREG-1801, a comparison between the AMR results and the tables of NUREG-1801 has been made. The results of that comparison are provided in two table types.

Table 1

The purpose of Table 1 is to provide a summary comparison of how the BFN AMR results align with the corresponding tables of NUREG-1801, Volume 1. The table is essentially the same as Tables 1 through 6 provided in NUREG-1801, Volume 1, except that the "Type" column has been replaced by a "Row Number" column and the "Item Number in NUREG-1801" column has been replaced by a "Discussion" column.

The "Item Number" column provides a means to cross-reference from Table 2 to Table 1.

The "Discussion" column is used by the applicant to provide clarifying/amplifying information. The following are examples of information that might be contained within this column:

- "Further Evaluation Recommended" information or reference to where that information is located (including a hyperlink if possible)
- The name of a plant specific program being used (and a hyperlink to the program if possible)
- Exceptions to 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

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

Table 2 provides the detailed results of the aging management reviews for those components identified in 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 BFN, the Engineered Safety Features Group contains tables specific to the Containment, Standby Gas Treatment, High Pressure Coolant Injection, Residual Heat Removal, etc. systems. Table 2 consists of the following nine columns:

- Component Type
- Intended Function
- Material
- Environment
- Aging Effect Requiring Management
- Aging Management Programs
- NUREG-1801 Volume 2 Item
- Table 1 Item
- Notes

Component Type

The first column identifies all of the component types from Section 2 of the LRA that are subject to aging management review. They are listed in alphabetical order.

Intended Function

The second column contains the license renewal intended functions (using abbreviations where necessary) for the listed component types. Definitions and abbreviations of passive component type intended functions are presented in Table **2.0.1**, Intended Function Abbreviations and Definitions.

Material

The third column lists the particular materials of construction for the component type.

Environment

The fourth column lists the environment to which the component types are exposed. Internal and external service environments are indicated, as appropriate. Descriptions of the internal and external service environments which were used in the aging management review to determine aging effects requiring management are included in Table **3.0.1**, Internal Service Environments, and Table **3.0.2**, External Service Environments.

Aging Effect Requiring Management

As part of the aging management review process, the applicant determines any aging effects requiring management for the material and environment combination in order to maintain the intended function of the component type. These aging effects requiring management are listed in column five.

Aging Management Programs

The aging management programs used to manage the aging effects requiring management are listed in column six of Table 2.

NUREG-1801 Vol. 2 Item

Each combination of component type, material, environment, aging effect requiring management, and aging management program that is listed in Table 2 is compared to NUREG-1801, Volume 2 with consideration given to the standard notes, to identify consistencies. When they are identified, they are documented by noting the appropriate NUREG-1801, Volume 2 item number in column seven of Table 2. If there is no corresponding item number in NUREG-1801, Volume 2, this row in column seven has "None". That way, a reviewer can readily identify where there is correspondence between the plant specific tables and NUREG-1801, Volume 2 tables.

Table 1 Item

Each combination of component, material, environment, aging effect requiring management, and aging management program that has an identified NUREG-1801 Volume 2 item number must also have a Table 3.x.1 line item reference number. The corresponding line item from Table 1 is listed in column eight of Table 2. If there is no corresponding item in NUREG-1801, Volume 1, this row in column eight has "None". That way, the information from the two tables can be correlated.

Notes

In order to realize the full benefit of NUREG-1801, BFN has aligned the information in the Tables 3.x.2.y with the information in NUREG-1801 Volume 2 using a series of notes. Notes that utilize letter designations are industry-standard notes taken from the Proposed Standard License Renewal Application Format Package[1]. Notes that use numeric designations are BFN plant-specific notes.

1 Letter from Alexander Marion (NEI) to Dr. P. T. Kuo (NRC), Project Number: 690, dated August 20, 2003

Table Usage

Table 1

Evaluate 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 BFN's 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.

Table 2

Table 2 contains the Aging Management Review information for the plant, whether or not it aligns with NUREG-1801. Each row within the table provides the intended function, material, environment, aging effect requiring management, and aging management program combination for a particular component type within a system. In addition, if there is a correlation between the combination in Table 2 and a combination in NUREG-1801 Volume 2, this is identified by a referenced item number in column seven, NUREG-1801, Volume 2 Item. If the column contains “None,” BFN was unable to locate an appropriately corresponding combination in NUREG-1801, Volume 2. Continuing across Table 2 from left to right within a given row, the next column is labeled Table 1 Item. If there is a reference number entered in this column, this reference number can be used to locate the corresponding row in Table 1 to see how the aging management program for this particular combination aligns with NUREG-1801, Volume 1.

Table 3.0.1 Internal Service Environments

Environment	Description
Air/Gas	Includes: • Air environment containing significant moisture such that condensation or water pooling may occur • Atmospheric air (when internal to components such as ventilation system components, components open to atmosphere, etc.), • Carbon Dioxide • Compressed air • Exhaust gas from diesel generators • Freon • Nitrogen
AFFF	Aqueous Film-Forming Foam utilized in the Fire Protection System
Fuel Oil	Diesel oil used for the emergency diesel generators, diesel fire pump, and other fuel oil systems.
Lubricating Oil	Lubricating oil for emergency diesel generators, pumps, and other in-scope plant equipment.
Raw Water	Raw water is not demineralized or chemically controlled to any significant extent. Raw water includes: • Water that enters the plant from the Wheeler Reservoir. Raw water is rough filtered to remove large particles and biocides may be added to prevent fouling. • Water that enters the plant from the potable water system. Biocides may be added to make the water suitable for human consumption. • Water that may be contaminated by impurities. Examples include condensation and water in drainage and waste collection systems.
Treated Water	Treated Water - base water for all clean systems. Treated water is demineralized water or chemically purified water. Treated water may have been injected with treatment chemicals in accordance with applicable chemistry control programs. Treated water may be in the form of: • Borated water in the standby liquid control system • High temperature water up to 288°C (550°F) such as reactor water and reactor feedwater • Low temperature oxygenated water • Reactor steam up to 288°C (550°F) • Water with corrosion inhibitors typically in closed systems

Table 3.0.2 External Service Environments

Environment	Definition
Adverse Localized Environment caused by heat, radiation, oxygen, moisture, or voltage	A condition in plant areas that house equipment required for 10 CFR 50.49 applications which creates a potential for various degradations and aging mechanisms.
Adverse Localized Environment caused by heat, radiation, or moisture in the presence of oxygen	A condition in a limited plant area that is significantly more severe than the specified service condition for the equipment, or an environment that creates a potential aging mechanism.
Adverse Localized Environment caused by exposure to moisture and voltage	A condition in underground conduit banks that creates a potential aging mechanism for medium voltage cables.
Buried	If above groundwater elevation, exposed to soil/fill. If below groundwater elevation, exposed to soil/fill and groundwater. Groundwater at BFN is non-aggressive.
Containment Atmosphere	Atmospheric air, maximum average temperature 150ºF, humidity up to 100%, potentially exposed to ionizing radiation, not exposed to weather.
Embedded/ Encased	Reinforcing steel or piping components partially or completely surrounded in by concrete.
Inside Air	Atmospheric air, maximum average temperature 150°F, humidity up to 100%, potentially exposed to ionizing radiation, not exposed to weather.
Outside Air	Outdoor environment, atmospheric air, mean annual temperature 62°F, including precipitation and wind. The outdoor air environment also includes exposure to ultraviolet radiation.
Raw Water	Raw water is not demineralized or chemically controlled to any significant extent. Raw water includes: • Water that enters the plant from the Wheeler Reservoir. Raw water is rough filtered to remove large particles and biocides may be added to prevent fouling. • Water that enters the plant from the potable water system. Biocides may be added to make the water suitable for human consumption. • Water that may be contaminated by impurities. Examples include condensation and water in drainage and waste collection systems.

Environment	Definition
Submerged	Exposed to a fluid or splash zone consisting of • Raw Water • Treated Water
Treated Water	Treated Water - base water for all clean systems. Treated water is demineralized water or chemically purified water. Treated water may have been injected with treatment chemicals in accordance with applicable chemistry control programs. Treated water may be in the form of: • Reactor steam up to 288°C (550°F) • High temperature water up to 288°C (550°F) such as reactor water and reactor feedwater • Low temperature oxygenated water • Water with corrosion inhibitors typically in closed systems • Borated water in the standby liquid control system

3.0.1 Summary of the Evaluation of the Unit 1 Layup and Preservation Program

An evaluation was performed to determine if any new aging effects required management during the renewal term as a result of the layup environments imposed on key in-scope Unit 1 systems and components by the Unit 1 layup and preservation program. The material groupings and aging effects were established using the same approach described in Section 3 of this application.

These SSCs were excluded:

- in-scope electrical and structural commodities which were not layed up
- shared systems, structures and components inservice to support Units 2 and 3 operation
- systems, structures and components inservice to support Unit 1
- commodities scheduled for replacement by the Unit 1 restart modification program

The following mechanical systems, components and environments were included in this evaluation:

Reactor Vessel and Internals, Reactor Recirculation, Reactor Water Cleanup, Control Rod Drive, and Boiler Drains and Vents Systems

The lay-up program maintained the internal environment of these systems with flowing, air-saturated, demineralized water with low chloride and sulfate concentrations.

Materials – Non-ferrous metals, carbon and low-alloy steel, stainless steel, nickel alloys, cast iron

Internal environment – Treated water

External environment – Inside air

Containment, Containment Atmosphere Dilution, and Containment Inerting

These systems were not formally incorporated into the layup program, but were included in the evaluation. The internal environment for the system components within the scope of license renewal contained relatively dry ambient reactor building air and residual nitrogen. The applicable portions of the containment system include all components except Torus and Torus attached piping.

Materials - Non-ferrous metals, carbon and low-alloy steel, stainless steel, cast iron, nickel-based alloys, zinc alloys, elastomers

Internal environment – Air/gas

External environments – Inside air, outside air, buried, embedded/encased

Containment, Condenser Circulating Water, Reactor Core Isolation, High Pressure Injection, Core Spray, and Gland Seal Water

These systems were not formally incorporated into the layup program, but were evaluated. Condenser Circulating Water components within the scope of license renewal were exposed to raw stagnant water for extended periods of time and Gland Seal Water components within the scope of license renewal were exposed to condensate water for extended periods of time. The applicable portion of the Reactor Core Isolation, High Pressure Injection, Core Spray, and Containment System includes Torus and Torus Attached Piping.

Materials - Non-ferrous metals, carbon and low-alloy steel, cast iron, glass, stainless steel, nickel based alloys

Internal environment – Treated water

External environment – Inside air, Treated water

Materials - Carbon and low-alloy steel, cast iron and cast iron alloys

Internal environment – Raw water

External environments – Inside air, outside air, buried, embedded/encased

Main Steam, Condensate and Demineralized Water, Feedwater, Heater Drains and Vents, Standby Liquid Control, Off-Gas, Reactor Core Isolation, High Pressure Injection, and Core Spray systems

The BFN lay-up program maintained the internal environment of these systems at < 60% RH de-humidified air.

Materials – Non-ferrous metals, carbon and low-alloy steel, stainless steel, cast iron, nickel-based alloys, glass, elastomers

Internal environment – Air/gas (<60% RH)

External environment – Inside air

No new aging effects requiring management during the renewal term were identified by this evaluation.

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 component types identified in Section **2.3.1**, Reactor Coolant 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:

Section	System No.	System Name
2.3.1.1		Reactor Vessel
2.3.1.2		Reactor Vessel Internals
2.3.1.3	010	Reactor Vessel Vents and Drains
2.3.1.4	068	Reactor Recirculation

Table **3.1.1**, Summary of Aging Management Evaluations for Reactor Coolant System Evaluated in Chapter IV of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the Reactor Coolant Systems component groups that are relied on for license renewal. This table uses the format described in Section **3.0**. Table 3.1.1 only provides results for those items that are applicable to a boiling water reactor (BWR). NUREG-1800 provides the basis for the further evaluation of the license renewal application to complete the summary of aging management evaluations in NUREG-1801 for plant specific considerations. When a further evaluation for Reactor Coolant Systems is recommended by the NUREG-1801, that further evaluation is identified in Table 3.1.1 and the evaluation in accordance with the NUREG-1800 basis is provided in Section **3.1.2.2**.

In its letter of October 18, 2001, the NRC staff found the BWRVIP-74 EPRI Report TR-113596,"BWR Vessel And Internals Project, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines" and Appendix A, "Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21)," acceptable for licensee participating in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) to reference in a LR application to the extent specified and under the limitations delineated in the LR FSER. Browns Ferry Nuclear Plant does participate in the BWRVIP. Browns Ferry Nuclear Plant's use of the BWRVIP-74 report and its evaluation of the limitations delineated in the NRC staff's SER associated with BWRVIP-74 is presented in section **3.1.2.2.16**.

3.1.2 Results

The following tables summarize the results of the aging management review for systems in the Reactor Coolant Systems group.

Table	System No.	System Name
3.1.2.1		Reactor Vessel
3.1.2.2		Reactor Vessel Internals
3.1.2.3	010	Reactor Vessel Vents and Drains
3.1.2.4	068	Reactor Recirculation

The materials from which specific components are fabricated, the environments to which components are exposed, the potential aging effects requiring management, and the aging management programs (AMPs) used to manage these aging effects are provided for each of the above systems in the following subsections of Section 3.1.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section	System No.	System Name
3.1.2.1.1		Reactor Vessel
3.1.2.1.2		Reactor Vessel Internals
3.1.2.1.3	010	Reactor Vessel Vents and Drains
3.1.2.1.4	068	Reactor Recirculation

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 components are:

- Carbon and low alloy steel
- Nickel alloy
- Stainless steel

Environment

The Reactor Vessel components are exposed to the following environments:

- Air/gas
- Inside Air
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Vessel, require management:

- Change in material properties and reduction in fracture toughness due to neutron irradiation embrittlement
- Crack initiation and growth due to stress corrosion, fatigue and cyclic loading
- Distortion/plastic deformation due to stress relaxation
- Loss of material due to galvanic, general, crevice, and pitting corrosion
- Loss of material due to mechanical wear

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Vessel components.

- ASME Section XI Subsections IWB, IWC, & IWD Inservice Inspection Program (**B.2.1.4**)
- BWR Control Rod Drive Return Line Nozzle Program (**B.2.1.9**)
- BWR Feedwater Nozzle Program (**B.2.1.8**)
- BWR Penetrations Program (**B.2.1.11**)
- BWR Vessel ID Attachment Welds Program (**B.2.1.7**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- One-time Inspection Program (**B.2.1.29**)
- Reactor Head Closure Studs Program (**B.2.1.6**)
- Reactor Vessel Surveillance Program (**B.2.1.28**)

3.1.2.1.2 Reactor Vessel Internals

Materials

The materials of construction for the Reactor Vessel Internals components are:

- Nickel alloy
- Stainless steel

Environment

The Reactor Vessel Internals components are exposed to the following environments:

- Air/gas
- Inside Air
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Vessel Internals, require management:

- Change in material properties and reduction in fracture toughness due to thermal aging and neutron irradiation embrittlement
- Crack initiation and growth due to stress corrosion and fatigue
- Loss of material due to crevice and pitting corrosion

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Vessel Internals components.

- ASME Section XI Subsections IWB, IWC, & IWD Inservice Inspection Program (**B.2.1.4**)
- BWR Vessel Internals Program (**B.2.1.12**)
- Chemistry Control Program (**B.2.1.5**)
- Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program(**B.2.1.14**)

3.1.2.1.3 Reactor Vessel Vents and Drains System (010)

Materials

The materials of construction for the Reactor Vessel Vents and Drains System components are:

- Carbon and low alloy steel
- Stainless steel

Environment

The Reactor Vessel Vents and Drains System components are exposed to the following environments:

- Air/gas
- Inside Air
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Vessel Vents and Drains System, require management:

- Change in material properties and reduction in fracture toughness due to thermal aging
- Crack initiation and growth due to stress corrosion, fatigue, and cyclic loading
- Loss of bolting function due to general corrosion and wear
- Loss of material due to flow accelerated corrosion
- Loss of material due to general, crevice, pitting, and galvanic corrosion

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Vessel Vents and Drains System components:

- ASME Section XI Subsections IWB, IWC, & IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.1.2.1.4 Reactor Recirculation System (068)

Materials

The materials of construction for the Reactor Recirculation System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Glass
- Stainless steel

Environment

The Reactor Recirculation System components are exposed to the following environments:

- Air/gas
- Inside Air
- Lubricating oil
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the Reactor Recirculation System, require management:

- Change in material properties and reduction in fracture toughness due to thermal aging
- Crack initiation and growth due to stress corrosion, fatigue, and cyclic loading
- Loss of bolting function due to general corrosion, stress relaxation, fatigue, crevice corrosion, pitting corrosion and wear
- Loss of material due to biofouling and MIC
- Loss of material due to general, crevice, pitting and galvanic corrosion
- Loss of material due to selective leaching

Aging Management Programs

The following AMPs manage the aging effects for the Reactor Recirculation System components:

- ASME Section XI Subsections IWB, IWC, & IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- One-time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- System Monitoring Program (**B.2.1.39**)

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1801

NUREG-1800 provides the basis for identifying those programs that warrant further evaluation by the applicant in the license renewal application. For the Reactor Coolant Systems, those further evaluations are addressed in the following sections.

3.1.2.2.1 Cumulative Fatigue Damage (BWR/PWR)

Per NUREG-1800 paragraphs 3.1.2.2.1 fatigue is a timed-limited aging analysis (TLAA) as defined in 10 CFR 54.3. The 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 **4.3**.

3.1.2.2.2 Loss of Material Due to General Corrosion (BWR/PWR)

1. The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.
2. The discussion in this paragraph of NUREG-1800 is not applicable to BFN since BFN does not have an isolation condenser.

3.1.2.2.3 Loss of Fracture Toughness Due To Neutron Irradiation Embrittlement (BWR/PWR)

1. Certain aspects of the loss of fracture toughness due to neutron irradiation embrittlement are a TLAA as defined in 10 CFR 54.3. The TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section **4.2**.
2. Loss of fracture toughness due to neutron irradiation embrittlement could occur in the reactor vessel. A reactor vessel materials surveillance program monitors neutron irradiation embrittlement of the reactor vessel. The BFN Reactor Vessel Surveillance Program description and the results of its license renewal evaluation for license renewal are presented in Section **B.2.1.28**.
3. The discussion in this paragraph of NUREG-1800 is applicable to Westinghouse and B&W PWRs only.

3.1.2.2.4 Crack Initiation and Growth due to Thermal and Mechanical Loading or Stress Corrosion Cracking (BWR/PWR)

1. Crack initiation and growth due to thermal and mechanical loading or SCC (including intergranular stress corrosion cracking [IGSCC]) could occur in small-bore reactor coolant system and connected system piping less than NPS 4. The BWR Stress Corrosion Cracking Program relies on the ASME Section XI ISI Program and the Chemistry Control Program to mitigate SCC. These programs are augmented by the One-Time Inspection Program to verify that service induced weld cracking is not occurring in the small-bore piping less than NPS 4, including pipe, fittings, and branch connections. A one-time inspection of a sample of locations is an acceptable method to ensure that the aging effect is not occurring and the component's intended function will be maintained during the period of extended operation. The One-Time Inspection Program (Section **B.2.1.29**) will manage service induced weld cracking in small-bore piping less than NPS 4, including pipe, fittings, and branch connections to ensure that the aging effect is not occurring and the component's intended function will be maintained during the period of extended operation.
2. The Aging Management Review (AMR) results for the reactor vessel flange leak detection line are listed in Table **3.1.2.1**, Reactor Vessel - Summary of Aging Management Evaluation and Table **3.4.2.3**, Feedwater System (003) - Summary of Aging Management Evaluation. The AMP for managing SCC of the vessel flange leak detection line is the One-Time Inspection Program (Section **B.2.1.29**).

   BFN jet pump sensing lines internal to the reactor vessel are not subject to an AMR. The AMR results for the jet pump sensing lines external to the reactor vessel are listed in Table **3.1.2.1**, Reactor Vessel - Summary of Aging Management Evaluation and Table **3.1.2.4**, Reactor Recirculation System (068) – Summary of Aging Management Evaluation. The AMP for managing SCC of the jet pump sensing lines external to the reactor vessel is the Chemistry Control Program (Section **B.2.1.5**) verified by the One-Time Inspection Program (Section **B.2.1.29**).

3. The discussion in this paragraph of NUREG-1800 is not applicable to BFN since BFN does not have an isolation condenser.

3.1.2.2.5 Crack Growth due to Cyclic Loading (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.6 Changes in Dimension due to Void Swelling (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.7 Crack Initiation and Growth due to Stress Corrosion Cracking or Primary Water Stress Corrosion Cracking (PWR)

1. The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.
2. The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.
3. The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.8 Crack Initiation and Growth due to Stress Corrosion Cracking or Irradiation Assisted Stress Corrosion Cracking (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.9 Loss of Preload due to Stress Relaxation (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.10 Loss of Section Thickness due to Erosion (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.11 Crack Initiation and Growth due to PWSCC, ODSCC, or Intergranular Attack or Loss of Material due to Wastage and Pitting Corrosion or Loss of Section Thickness due to Fretting and Wear or Denting due to Corrosion of Carbon Steel Tube Support Plate (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.12 Loss of Section Thickness due to Flow Accelerated Corrosion

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.13 Ligament Cracking due to Corrosion (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.1.2.2.14 Loss of Material due to Flow Accelerated Corrosion (PWR)

The discussion in this paragraph of NUREG-1800 is applicable to CE PWRs only.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Section **B.1.3** of this application for further discussion.

3.1.2.2.16 Boiling Water Reactor Vessel and Internals Project -74-A Report Response (F.6)

The BWRVIP-74-A report provides generic guidelines intended to present the appropriate inspection and flaw evaluation recommendations to assure safety function integrity of the reactor pressure vessel components during both the current operating term and the license renewal period. The components addressed include the vessel shell, top and bottom heads, closure flanges and studs, support skirts, nozzles, safe ends, penetrations, internal and external attachments, in-core monitor housings, control rod drive stub tubes, and pressure boundary portions of control rod drive housings. As documented in the license renewal final safety evaluation report transmitted on October 18, 2001 (NRC Accession No. ML012400381), the NRC staff has completed its review of the BWRVIP-74 report. As indicated in the license renewal final safety evaluation report, the staff finds the report acceptable for licensees participating in the BWRVIP to reference in a LR application to the extent specified and under the limitations delineated in the license renewal final safety evaluation report. As requested in the SER, the report was revised to include the SER and issued as BWRVIP-74-A. The license renewal final safety evaluation report indicates that, by referencing the BWRVIP-74-A report and the AMPs in it, and completing the action items, an applicant will provide sufficient information for the staff to make a finding that there is reasonable assurance that the applicant will adequately manage the effects of aging so that the intended functions of the reactor vessel components covered by the scope of the report will be maintained consistent with the current licensing basis during the period of extended operation.

BFN participates in the BWRVIP and relies on the BWRVIP-74-A report in this LRA. BFN commits to the accepted AMPs defined in BWRVIP-74-A, and has completed or commits to complete the action items described in the license renewal final safety evaluation report as discussed below.

3.1.2.2.16.1 Reactor Applicant Action Item 1

“The LR applicant is to verify that the BWRVIP-74 report is applicable to its plant. Further, the LR applicant is to commit to programs described as necessary in the BWRVIP-74 report to manage the effects of aging on the functionality of the reactor pressure vessel (RPV) components during the period of extended operation. LR applicants will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMP within the BWRVIP-74 report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the LR applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).”

BFN Response:

BFN participates in the BWRVIP. As such, the BWRVIP is applicable to the BFN reactors. For current and future open issues between the BWRVIP and NRC, BFN will work as part of the BWRVIP to resolve these issues generically. When the issues are resolved, BFN will follow the BWRVIP recommendations resulting from that resolution. If BFN cannot follow the resolution, then BFN will notify the NRC in accordance with the BWRVIP commitment (i.e., within 45 days of the NRC approval of the issue).

The programs described as necessary in the BWRVIP-74-A report to manage the effects of aging on the functionality of the RPV components during the period of extended operation are summarized in BWRVIP-74-A Table 4-1. BFN commitments to the various programs required by BWRVIP-74-A are stated in the program descriptions in Appendix **B**, Aging Management Program Descriptions, and are included in Appendix **A**, UFSAR Supplement. The commitments will be included in the UFSAR when revised in accordance with 10 CFR 54.37 following the issuance of the renewed licenses.

The following Table lists the BWRVIP-74-A items and describes the BFN position for each item.

BWRVIP-74-A Table 4-1 Item	BFN Position
Circumferential Seam Welds ASME Section XI IWB 2500-1 with augmented examination requirements per RG 1.150 if no relief authorized per GL 98-05	In accordance with GL 98-05, BFN has received relief from the inspection requirements[1]. See TLAA discussion in Section **4.2.6**, Reactor Vessel Circumferential Weld Examination Relief Request, which demonstrates that at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E of the staff's July 28, 1998, FSER. See also Section **3.1.2.2.16.11** for a discussion of BWRVIP-74-A Required Action 11.
Vertical Seam Welds ASME Section XI IWB 2500-1 with augmented examination requirements per RG 1.150 if no relief authorized per GL 98-05	Relief has not been requested per GL 98-05.

1 NRC letter to TVA (Accession No. ML003740638), "Browns Ferry Nuclear Plant Unit 2, Relief Request 2-ISI-9, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA8424)," August 14, 2000, NRC letter to TVA (Accession No. ML993300264), "Browns Ferry Nuclear Plant Unit 3, Relief Request 3-ISI-1, Revision 1, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC NO. MA5953)," November 18, 1999.

BWRVIP-74-A Table 4-1 Item	**BFN Position**
Full Penetration Nozzle Welds ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per RG 1.150 and NUREG-0619 if no plant specific program authorized.	BFN effectively manages the aging effects of the Full Penetration Nozzle Welds in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB. Table IWB 2500-1 with augmented examination and frequency requirements of NUREG-0619, as modified, as demonstrated in Section **B.2.1.4** and **B.2.1.8**.
CRD Nozzle Welds ASME Section XI IWB 2500-1 with no augmented examination and frequency requirements per BWRVIP-47	BFN effectively manages the aging effects of the CRD Nozzle Welds in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 with augmented examination and frequency requirements of BWRVIP-47 as demonstrated in Section **B.2.1.4** and **B.2.1.9**.
ICM Nozzle Welds ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per BWRVIP-49	BFN effectively manages the aging effects of the ICM Nozzle welds in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 with augmented examination and frequency requirements of BWRVIP-49 as demonstrated in Section **B.2.1.4** and **B.2.1.11**.
SLC Nozzle Safe End Weld ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per BWRVIP-27	BFN effectively manages the aging effects of the SLC Nozzle Safe End Welds in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 with augmented examination and frequency requirements of BWRVIP-27 as demonstrated in Section **B.2.1.4** and **B.2.1.11**.
Safe End Welds ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per NUREG-0313	BFN effectively manages the aging effects of the Safe End Welds in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB , Table IWB 2500-1 as demonstrated in Section **B.2.1.4** with augmented examination and frequency requirements of NUREG-0313 (as modified by staff approved BWRVIP-75) as demonstrated in Section **B.2.1.10**.
Closure Head Studs ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Reactor Vessel Closure Head Studs in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section **B.2.1.4** and **B.2.1.6**.

BWRVIP-74-A Table 4-1 Item	BFN Position
Top Head Flange Bolts ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Top Head Flange Bolts in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section B.2.1.4.
Skirt and Stabilizer Attachment Welds ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Skirt and Stabilizer Attachment Welds in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section B.2.1.4.
Vessel Interior Surfaces ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Reactor Vessel Interior Surfaces in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section B.2.1.4.
Shroud Support Attachment ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per BWRVIP-38	BFN effectively manages the aging effects of the Shroud Support Attachments in accordance with the inspection and flaw evaluation guidelines of staff-approved BWRVIP-38, BWR Shroud Support Inspection and Flaw Evaluation Guidelines, EPRI Topical Report TR-108823, September 1997 as demonstrated in Section B.2.1.4 and B.2.1.12.
Core Spray Attachments ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per BWRVIP-48 and BWRVIP-18	BFN effectively manages the aging effects of the Core Spray Attachments in accordance with the inspection and flaw evaluation guidelines of staff-approved boiling water reactor vessel and internals project BWRVIP-48, BWR Vessel and Internals Project, “Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines,” (EPRI Report TR-108724), February 1998) and BWRVIP-18, BWR Vessel and Internals Project, “BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines,” (EPRI Report TR-106740), July 1996), as demonstrated in Sections B.2.1.4, B.2.1.7, and B.2.1.12.
Riser Brace Attachments ASME Section XI IWB 2500-1 with augmented examination and frequency requirements per BWRVIP-48 and BWRVIP-41	BFN effectively manages the aging effects of the Jet Pump Riser Brace Attachments in accordance with the inspection and flaw evaluation guidelines of staff-approved boiling water reactor vessel and internals project BWRVIP-48, BWR Vessel and Internals Project, “Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines,” (EPRI Report TR-108724), February 1998) and BWRVIP-41, “BWR Vessel and Internals Project, BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines, (EPRI Report TR-108728),” October 1997 as demonstrated in Section B.2.1.4, B.2.1.7, and B.2.1.12.

BWRVIP-74-A Table 4-1 Item	BFN Position
Dryer Support and FW Sparger Attachments ASME Section XI IWB 2500-1 with augmented examination requirements per BWRVIP-48 for furnace sensitized material or Alloy 182 welds.	BFN effectively manages the aging effects of the Dryer Support and FW Sparger Attachments in accordance with the inspection and flaw evaluation guidelines of staff-approved boiling water reactor vessel and internals project BWRVIP-48, BWR Vessel and Internals Project, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines," (EPRI Report TR-108724), February 1998), as demonstrated in Sections **B.2.1.4**, **B.2.1.7**, and **B.2.1.12**.
Other Vessel Interior Attachments ASME Section XI IWB 2500-1 with no additional requirements per BWRVIP-48.	BFN effectively manages the aging effects of the Vessel ID Attachment Welds in accordance with the inspection and flaw evaluation guidelines of staff-approved boiling water reactor vessel and internals project BWRVIP-48, BWR Vessel and Internals Project, "Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines," (EPRI Report TR-108724), February 1998), BWRVIP-48 as demonstrated in Section **B.2.1.4** and **B.2.1.7**.
Vessel Exterior Attachments - Skirt ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Vessel Exterior Skirt in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section **B.2.1.4**.
Vessel Exterior Attachments - Stabilizer Bracket ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Vessel Exterior Stabilizer Brackets in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section **B.2.1.4**.
Vessel Exterior ASME Section XI IWB 2500-1	BFN effectively manages the aging effects of the Vessel Exterior in accordance with the requirements of the American Society of Mechanical Engineers, Code, Section XI, Subsection IWB, Table IWB 2500-1 as demonstrated in Section **B.2.1.4**.

3.1.2.2.16.2 Reactor Applicant Action Item 2

"10 CFR 54.21(d) requires that an UFSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAA for the period of extended operation. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the programs and activities specified as necessary in the BWRVIP-74 report are summarily described in the UFSAR supplement."

BFN Response:

The UFSAR supplement includes the programs and activities specified as necessary in the BWRVIP-74-A report as follows:

BWRVIP-74-A Table 4-1 Item	AMP Description in Sections	UFSAR Supplement
Circumferential Seam Welds	4.2.6	A.3.1.6
Vertical Seam Welds	B.2.1.4	A.1.4
Full Penetration Nozzle Welds	B.2.1.4, B.2.1.8	A.1.4, A.1.8
CRD Nozzle Welds	B.2.1.4, B.2.1.9	A.1.4, A.1.9
ICM Nozzle Welds	B.2.1.4, B.2.1.11	A.1.4, A.1.11
SLC Nozzle Safe End Welds	B.2.1.4, B.2.1.11	A.1.4, A.1.11
Safe End Welds	B.2.1.4, B.2.1.10	A.1.4, A.1.10
Closure Head Studs	B.2.1.4, B.2.1.6	A.1.4, A.1.6
Top Head Flange Bolts	B.2.1.4	A.1.4
Skirt and Stabilizer Attachment Welds	B.2.1.4	A.1.4
Vessel Interior Surfaces	B.2.1.4	A.1.4
Shroud Support Attachment	B.2.1.4, B.2.1.12	A.1.4, A.1.12
Core Spray Attachments	B.2.1.4, B.2.1.7, B.2.1.12	A.1.4, A.1.7, A.1.12
Riser Brace Attachments	B.2.1.4, B.2.1.7, B.2.1.12	A.1.4, A.1.7, A.1.12
Dryer Support and FW Sparger Attachments	B.2.1.4, B.2.1.7, B.2.1.12	A.1.4, A.1.7, A.1.12
Other Vessel Interior Attachments	B.2.1.4, B.2.1.7	A.1.4, A.1.7
Vessel Exterior Attachments - Skirt	B.2.1.4	A.1.4
Vessel Exterior Attachments - Stabilizer Bracket	B.2.1.4	A.1.4
Vessel Exterior	B.2.1.4	A.1.4

In addition, the UFSAR supplement Section A.1.25 includes the reactor vessel surveillance program described in Section B.2.1.28.

3.1.2.2.16.3 Reactor Applicant Action Item 3

"10 CFR 54.22 requires that each LR application include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the LR application. In its Appendix A to the BWRVIP-74 report, the BWRVIP stated that technical specification changes resulting from neutron embrittlement will be made at the appropriate time prior to the end of the current license. Those LR applicants referencing the BWRVIP-74 report for the RPV components shall ensure that the inspection strategy described in the BWRVIP-74 report does not conflict or result in any changes to their technical specifications. If technical specification changes do result, then the applicant should ensure that those changes are included in its LR application."

BFN Response:

No Technical Specification changes are required for the inspection strategy described in the BWRVIP-74-A report.

3.1.2.2.16.4 Reactor Applicant Action Item 4

"The staff is concerned that leakage around the reactor vessel seal rings could accumulate in the VFLD lines, cause an increase in the concentration of contaminants and cause cracking in the VFLD line. The BWRVIP-74 report does not identify this component as within the scope of the report. However, since the VFLD line is attached to the RPV and provides a pressure boundary function, LR applicants should identify an AMP for the VFLD line."

BFN Response:

The BFN reactor vessel flange leak detection line is included within the scope of license renewal. See the scoping and screening results for the Feedwater System (Section **2.3.4.3**). The AMR Results for the Feedwater System are presented in Table **3.4.2.3** and NUREG-1800 further evaluation of cracking in the reactor vessel flange leak detection line is presented in Section **3.1.2.2.4**. The AMP for managing SCC is a One-Time Inspection (Section **B.2.1.29**)

3.1.2.2.16.5 Reactor Applicant Action Item 5

"LR applicants shall describe how each plant-specific aging management program addresses the following elements: (1) scope of the program, (2) preventive actions, (3) parameters monitored or inspected, (4) detection of aging effects, (5) monitoring and trending, (6) acceptance criteria, (7) corrective actions, (8) confirmation process, (9) administrative controls, and (10) operating experience."

BFN Response:

The description of AMPs credited for license renewal at BFN is provided in Appendix **B**. The presentation of AMP elements are consistent with the guidance provided in ISG 10.

3.1.2.2.16.6 Reactor Applicant Action Item 6

"The staff believes inspection by itself is not sufficient to manage cracking. Cracking can be managed by a program that includes inspection and water chemistry. BWRVIP-29 describes a water chemistry program that contains monitoring and control guidelines for BWR water that is acceptable to the staff. BWRVIP-29 is not discussed in the BWRVIP-74 report. Therefore, in addition to the previously discussed BWRVIP reports, LR applications shall contain water chemistry programs based on monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-29."

BFN Response:

As described in Section **B.2.1.10**, the BFN BWR Stress Corrosion Cracking Program includes water chemistry control as a preventive measure. As discussed in Section **B.2.1.5**, the BFN Chemistry Control Program is based on the monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-79.

3.1.2.2.16.7 Reactor Applicant Action Item 7

"LR applicants shall identify their vessel surveillance program, which is either an ISP or plant-specific in-vessel surveillance program, applicable to the LR term."

BFN Response:

As described in Section **B.2.1.28** and UFSAR **4.2**, the BFN Reactor Vessel Surveillance program is an integrated surveillance program. The program currently relies on BWRVIP-78 and BWRVIP-86[2] and will be updated in accordance with future BWRVIP initiatives as necessary (**F.6**).

3.1.2.2.16.8 Reactor Applicant Action Item 8

"LR applicants should verify that the number of cycles assumed in the original fatigue design is conservative to assure that the estimated fatigue usage for 60 years of plant operation is not underestimated. The use of alternative actions for cases where the estimated fatigue usage is projected to exceed 1.0 will require case-by-case staff review and approval. Further, a LR applicant must address environmental fatigue for the components listed in the BWRVIP-74 report for the LR period."

BFN Response:

See TLAA discussion in Section **4.3.1**, Reactor Vessel Fatigue Analyses, and Section **4.3.2**, Fatigue Analyses of Reactor Vessel Internals. See discussion in Section **4.3.4** for the BFN position on environmental fatigue.

3.1.2.2.16.9 Reactor Applicant Action Item 9

"Appendix A to the BWRVIP-74 report indicates that a set of P-T curves should be developed for the heatup and cooldown operating conditions in the plant at a given EFPY in the LR period."

2 RC letter (Accession No. ML030290418) to TVA, "Browns Ferry Nuclear Plant, Units 2 and 3 — Issuance of Amendments Re: Implementation of the Boiling-Water Reactor Vessel and Internals Project Reactor Pressure Vessel Integrated Surveillance Program to Address the Requirements of Appendix H to 10 CFR Part 50 (TAC Nos. MB6677 AND MB6678)," dated January 28, 2003.

BFN Response:

See TLAA discussion of TLAA in Section 4.2.5 for BFN's disposition of the neutron embrittlement TLAA for "Reactor Vessel Thermal Limit Analyses - Operating Pressure-Temperature Limit Curves."

3.1.2.2.16.10 Reactor Applicant Action Item 10

"To demonstrate that the beltline materials meet the Charpy USE criteria specified in Appendix B or the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR/3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, Revision 2."

BFN Response:

See TLAA discussion in Section 4.2.1, Reactor Vessel Materials Upper Shelf Energy Reduction due to Neutron Embrittlement.

3.1.2.2.16.11 Reactor Applicant Action Item 11

"As an alternative to satisfying the limiting conditional failure frequency for circumferential welds in Appendix E of the staff's July 28, 1998, FSER, the BWRVIP proposes either: (1) Perform a one-time inspection of the circumferential welds in accordance with the requirements of ASME Section XI within two refueling outages of the start of the renewal period. If the results from the inspection meet ASME Code acceptance criteria, no further examination or analyses are required for the remainder of the renewal period, or (2) Perform plant-specific analysis to assess the probability of vessel failure at the end of the renewal period. The analysis should be consistent with the analytical approach in the NRC FSER including any subsequent revisions, etc., and should be based on the chemistry of the limiting weld and the predicted neutron fluence at the end of the LR period. The calculated probability of failure should be less than or equal to that stated in Appendix E of the staff's FSER. The plant-specific analysis should be submitted to the NRC for inspection relief.

The second alternative is acceptable to the NRC; but the first alternative is not acceptable.

To obtain relief from the inservice inspection of the circumferential welds during the LR period, the BWRVIP report indicates each licensee will have to demonstrate that (1) at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E of the staff's July 28, 1998, FSER, and (2) that they have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER."

BFN Response:

See TLAA discussion in Section **4.2.6**, Reactor Vessel Circumferential Weld Examination Relief Request that demonstrates that at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E of the staff's July 28, 1998, FSER. See relief request approvals[3] for documentation that BFN has implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER.

3.1.2.2.16.12 Reactor Applicant Action Item 12

"As indicated in the staff's March 7, 2000, letter to Carl Terry, a LR applicant shall monitor axial beltline weld embrittlement. One acceptable method is to determine the mean RT_{NDT} of the limiting axial beltline weld at the end of the extended period of operation is less than the values specified in Table 1 of this FSER. Table 1 specifies

Table 1: Comparison of Results from Staff and BWRVIP

Plant	Initial RT_{NDT} (°F)	Mean RT_{NDT} (°F)	Vessel Failure Freq	
			Staff	BWRVIP
Clinton	30	91	2.73 E -6	1.52 E -6
Pilgrim	48	68	2.24 E -7	-------
Mod 1 *	0	116	5.51 E -6	1.55 E -6
Mod 2 **	-2	114	5.02 E -6	-------

* A variant of Pilgrim input data, with initial RT_{NDT} = 0 °F.

** A variant of Pilgrim input data, with initial RT_{NDT} = -2 °F"

BFN Response:

See discussion of Reactor Vessel Charpy Upper-Shelf Energy (USE) Reduction and RT_{NDT} Increase TLAA in Section **4.2.1**.

3 NRC letter to TVA, "Browns Ferry Nuclear Plant Unit 2, Relief Request 2-ISI-9, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA8424)," dated August 14, 2000, NRC letter to TVA, "Browns Ferry Nuclear Plant Unit 3, Relief Request 3-ISI-1, Revision 1, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC NO. MA5953)," dated November 18, 1999.

3.1.2.2.16.13 Reactor Applicant Action Item 13

"The Charpy USE, P-T limit, circumferential weld and axial weld RPV integrity evaluations are all dependent upon the neutron fluence. The applicant may perform neutron fluence calculations using a staff approved methodology or may submit the methodology for staff review. If the applicant performs the neutron fluence calculation using a methodology previously approved by the staff, the applicant should identify the NRC letter that approved the methodology."

BFN Response:

BFN used the methodology of GE Nuclear Energy Topical Report NEDC-32983P, "'General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluations," to perform the neutron fluence calculation for the neutron embrittlement TLAA (Section **4.2**). That methodology was approved by NRC Letter (Accession No. ML012400381) from Stuart A. Richards, Director, Project Directorate IV, to James F. Klapproth, Manager, Engineering and Technology, GE Nuclear Energy, "Safety Evaluation for NEDC-32983P, 'General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation,' (TAC No. MA9891)," September 14, 2001.

3.1.2.2.16.14 Reactor Applicant Action Item 14

"Components that have indications that have been previously analytically evaluated in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period, shall be re-evaluated for the 60 year service period corresponding to the LR term."

BFN Response:

There are no indications that have been previously analytically evaluated in accordance with Subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period. Therefore, no indications require re-evaluation for the 60 year service period corresponding to the LR term.

3.1.2.3 Time-Limited Aging Analysis

TLAAs identified for Reactor Coolant System include:

- Reactor Vessel Neutron Embrittlement (Section **4.2**)
- Metal Fatigue (Section **4.3**)
- IASCC (Irradiation Assisted Stress Corrosion Cracking) of Reactor Vessel Internals (Section **4.7.6**)
- Stress Relaxation of the Core Plate Hold-down Bolts (Section **4.7.7**)

3.1.3 Conclusion

The Reactor Coolant Systems piping, fittings, and components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.4. The AMPs selected to manage aging effects for the Reactor Coolant Systems components are identified in the system summary tables and Section **3.1.2.1**.

Descriptions of these AMPs are 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 Reactor Coolant 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

Table 3.1.1: Summary of Aging Management Evaluations for Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management	Further Evaluation Recommended	Discussion
3.1.1.1	Reactor coolant pressure boundary components	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR54.21(c)	Yes, TLAA	Consistent with NUREG-1801. See further evaluation in Section **3.1.2.2.1.** See discussion of TLAA in Section **4.3**.
3.1.1.2	PWR only.				
3.1.1.3	Isolation condenser	Loss of material due to general, pitting, and crevice corrosion	Inservice inspection; water chemistry	Yes, plant specific	Not applicable to BFN. BFN does not have an isolation condenser. The isolation condenser function at BFN is performed by the RCIC System.
3.1.1.4	Pressure vessel ferritic materials that have a neutron fluence greater than 10^{17} n/cm^2 (E>1 MeV)	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA, evaluated in accordance with Appendix G of 10 CFR 50 and RG 1.99	Yes, TLAA	Consistent with NUREG-1801. See further evaluation in Section **3.1.2.2.3.** See description of TLAA in Section **4.2**.
3.1.1.5	Reactor vessel beltline shell and welds	Loss of fracture toughness due to neutron irradiation embrittlement	Reactor vessel surveillance	Yes, plant specific	See further evaluation in Section **3.1.2.2.3.** See description of AMP in Section **B.2.1.28**.
3.1.1.6	PWR only.				
3.1.1.7	Small-bore reactor coolant system and connected systems piping	Crack initiation and growth due to stress corrosion cracking (SCC), intergranular stress corrosion cracking (IGSCC), and thermal and mechanical loading	Inservice inspection; water chemistry; one-time inspection	Yes, parameters monitored/inspected and detection of aging effects are to be further	Consistent with NUREG-1801 with exceptions. See further evaluation in Section **3.1.2.2.4.** See discussion of AMP in Section **B.2.1.4** **B.2.1.5,** and **B.2.1.29.**
3.1.1.8	Jet pump sensing line and reactor vessel flange leak detection line	Crack initiation and growth due to SCC, IGSCC, or cyclic loading	Plant specific	Yes, plant specific	See further evaluation in Section **3.1.2.2.4.**
3.1.1.9	Isolation condenser	Crack initiation and growth due to SCC or cyclic loading	Inservice inspection; water chemistry	Yes, plant specific	Not applicable to BFN. BFN does not have an isolation condenser. The isolation condenser function at BFN is performed by the RCIC System.
3.1.1.10	PWR only.				
3.1.1.11	PWR only.				
3.1.1.12	PWR only.				
3.1.1.13	PWR only.				

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.1: Summary of Aging Management Evaluations for Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management	Further Evaluation Recommended	Discussion
3.1.1.14	PWR only.				
3.1.1.15	PWR only.				
3.1.1.16	PWR only.				
3.1.1.17	PWR only.				
3.1.1.18	PWR only.				
3.1.1.19	PWR only.				
3.1.1.20	PWR only.				
3.1.1.21	PWR only.				
3.1.1.22	Reactor vessel closure studs and stud assembly	Crack initiation and growth due to SCC and/or IGSCC	Reactor head closure studs	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.6.**
3.1.1.23	CASS pump casing and valve body	Loss of fracture toughness due to thermal aging embrittlement	Inservice inspection	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.4.**
3.1.1.24	CASS piping	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	Not applicable to BFN. No RPCB CASS piping and fitting are used at BFN.
3.1.1.25	BWR piping and fittings; steam generator components	Wall thinning due to flow accelerated corrosion	Flow accelerated corrosion	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.15.**
3.1.1.26	Reactor coolant pressure boundary (RCPB) valve closure bolting, manway and holding bolting, closure bolting in high-pressure and high-temperature systems	Loss of material due to wear; loss of preload due to stress relaxation; and crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.16**
3.1.1.27	Feedwater and control rod drive (CRD) return line nozzles	Crack initiation and growth due to cyclic loading	Feedwater nozzle; CRD return line nozzle	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.8** and **B.2.1.9.**
3.1.1.28	Vessel shell attachment welds	Crack initiation and growth due to SCC and/or IGSCC	BWR Vessel ID attachment welds; water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.7** and **B.2.1.5.**

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.1: Summary of Aging Management Evaluations for Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management	Further Evaluation Recommended	Discussion
3.1.1.29	Nozzle safe ends, recirculation pump casing, connected systems piping and fittings, body and bonnet of valves	Crack initiation and growth due to SCC and/or IGSCC	BWR stress corrosion cracking; water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.10** and **B.2.1.5.**
3.1.1.30	Penetrations	Crack initiation and growth due to SCC, IGSCC, and/or cyclic loading	BWR bottom head penetrations; water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.11** and **B.2.1.5.**
3.1.1.31	Core shroud and core plate, support structure, top guide, core spray lines and spargers, jet pump assemblies, control rod drive housing, nuclear instrument guide tubes	Crack initiation and growth due to SCC, IGSCC, and/or IASCC	BWR vessel internals; water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.12** and **B.2.1.5.**
3.1.1.32	Core shroud and core plate access hole cover (welded and mechanical covers)	Crack initiation and growth due to SCC, IGSCC, and/or IASCC	ASME Section XI inservice inspection; water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.4** and **B.2.1.5.**
3.1.1.33	Jet pump assembly castings and orificed fuel support	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal aging and neutron irradiation embrittlement	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.14.**
3.1.1.34	Unclad top head and nozzles	Loss of material due to general, pitting, and crevice corrosion	Inservice inspection; water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Sections **B.2.1.4** and **B.2.1.5.**
3.1.1.35	PWR only.				
3.1.1.36	PWR only				
3.1.1.37	PWR only				
3.1.1.38	PWR only				
3.1.1.39	PWR only				
3.1.1.40	PWR only				
3.1.1.41	PWR only				
3.1.1.42	PWR only				
3.1.1.43	PWR only				

Table 3.1.1: Summary of Aging Management Evaluations for Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management	Further Evaluation Recommended	Discussion
3.1.1.44	PWR only				
3.1.1.45	PWR only				
3.1.1.46	PWR only				
3.1.1.47	PWR only				
3.1.1.48	PWR only				

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Other External Attachments	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.2-e	None	F, 1
Reactor Vessel Attachment Welds	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.2-e	None	F, 1
Reactor Vessel Attachment Welds	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	BWR Vessel ID Attachment Welds (**B.2.1.7**) Chemistry Control Program (**B.2.1.5**)	IV.A1.2-e	None	F, 2
Reactor Vessel Attachment Welds	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel ID Attachment Welds (**B.2.1.7**) Chemistry Control Program (**B.2.1.5**)	IV.A1.2-e	None	H, 2
Reactor Vessel Attachment Welds	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel ID Attachment Welds (**B.2.1.7**) Chemistry Control Program (**B.2.1.5**)	IV.A1.2-e	**3.1.1.28**	B
Reactor Vessel Closure Studs and Nuts	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	Reactor Head Closure Studs Program (**B.2.1.6**)	IV.A1.1-c	**3.1.1.22**	A
Reactor Vessel Closure Studs and Nuts	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, general, and pitting corrosion.	Reactor Head Closure Studs Program (**B.2.1.6**)	IV.A1.1-c	None	H, 2
Reactor Vessel Closure Studs and Nuts	PB	Carbon and Low Alloy Steel	Inside Air (external)	Distortion/plastic deformation due to stress relaxation. Loss of material due to mechanical wear.	Reactor Head Closure Studs Program (**B.2.1.6**)	IV.A1.1-c	None	G, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Crack initiation/growth due to cyclic loading. Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection (**B.2.1.29**)	IV.A1.1-d	None	F, 2

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.1-a	None	G, 1
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.1-d	None	F, 1
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.2-a	None	G, 1
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.2-b	None	G, 1
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.6-a	None	G, 1
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.1-a	None	H, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.1-a	**3.1.1.34**	B
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) (**B.2.1.4**)	IV.A1.1-b	None	H, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.1-b	**3.1.1.1**	A

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.1-b	None	H, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.2-a	**3.1.1.1**	A
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.2-a	None	H, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.2-b	None	H, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.2-b	**3.1.1.1**	A
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to neutron irradiation embrittlement.	None	IV.A1.2-c	**3.1.1.4**	A
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to neutron irradiation embrittlement.	Reactor Vessel Surveillance Program (**B.2.1.28**)	IV.A1.2-d	**3.1.1.5**	A
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.6-a	**3.1.1.1**	A
Reactor Vessel Heads, Flanges, Shell	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.6-a	None	H, 2

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Heads, Flanges, Shell	PB, SS	Nickel Alloy	Air/gas (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	None	None	J, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Nickel Alloy	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.6-a	None	H, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Stainless Steel	Air/gas (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.2-a	None	F, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.2-a	None	F, 2
Reactor Vessel Heads, Flanges, Shell	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.2-b	None	H, 2
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.1-a	None	G, 1
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.3-a	None	G, 1
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.3-b	None	G, 1
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV-A1.3-c	None	G, 1

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.1-a	**3.1.1.34**	B
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.1-a	None	H, 2
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.3-a	None	H, 2
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.3-a	**3.1.1.1**	A
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	BWR Feedwater Nozzle Program (**B.2.1.8**)	IV.A1.3-b	**3.1.1.27**	A
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	BWR Feedwater Nozzle Program (**B.2.1.8**) Chemistry Control Program (**B.2.1.5**)	IV.A1.3-b	None	H, 2
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	BWR Control Rod Drive Return Line Nozzle (**B.2.1.9**)	IV.A1.3-c	**3.1.1.27**	A
Reactor Vessel Nozzles	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.3-d	**3.1.1.1**	A
Reactor Vessel Nozzles	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.3-a	None	H, 2

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Nozzles	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	BWR Control Rod Drive Return Line Nozzle (**B.2.1.9**) Chemistry Control Program (**B.2.1.5**)	IV.A1.3-c	None	H, 2
Reactor Vessel Nozzles Safe Ends	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.4-a	None	G, 1
Reactor Vessel Nozzles Safe Ends	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion..	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.4-a	None	F, 2
Reactor Vessel Nozzles Safe Ends	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.4-a	None	H, 2
Reactor Vessel Nozzles Safe Ends	PB	Stainless Steel	Inside Air (external)	None	None	IV.A1.4-a	None	G, 2
Reactor Vessel Nozzles Safe Ends	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.3-b	**3.1.1.1**	A
Reactor Vessel Nozzles Safe Ends	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.A1.4-a	None	H, 2
Reactor Vessel Nozzles Safe Ends	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.A1.4-a	**3.1.1.29**	B
Reactor Vessel Nozzles Safe Ends	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.4-a	None	H, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Penetrations	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.A1.5-a	None	F, 1
Reactor Vessel Penetrations	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	BWR Penetrations Program (**B.2.1.11**) Chemistry Control Program (**B.2.1.5**)	IV.A1.5-a	None	F, 2
Reactor Vessel Penetrations	PB, SS	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.A1.5-a	None	F, 2
Reactor Vessel Penetrations	PB, SS	Nickel Alloy	Inside Air (external)	None	None	IV.A1.5-a	None	G, 2
Reactor Vessel Penetrations	PB, SS	Nickel Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Penetrations Program (**B.2.1.11**) Chemistry Control Program (**B.2.1.5**)	IV.A1.5-a	None	H, 2
Reactor Vessel Penetrations	PB, SS	Nickel Alloy	Treated Water (internal)	Crack initiation/growth due to cyclic loading, stress corrosion cracking (SCC).	BWR Penetrations Program (**B.2.1.11**) Chemistry Control Program (**B.2.1.5**)	IV.A1.5-a	**3.1.1.30**	B
Reactor Vessel Penetrations	PB, SS	Nickel Alloy	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.5-b	**3.1.1.1**	A
Reactor Vessel Penetrations	PB, SS	Stainless Steel	Inside Air (external)	None	None	IV.A1.5-a	None	G, 2
Reactor Vessel Penetrations	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Penetrations Program (**B.2.1.11**) Chemistry Control Program (**B.2.1.5**)	IV.A1.5-a	None	H, 2
Reactor Vessel Penetrations	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading, stress corrosion cracking (SCC).	BWR Penetrations Program (**B.2.1.11**) Chemistry Control Program (**B.2.1.5**)	IV.A1.5-a	**3.1.1.30**	B

Table 3.1.2.1: Reactor Vessel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Penetrations	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.A1.5-b	3.1.1.1	A
Reactor Vessel Support Skirt and Attachment Welds	SS	Carbon and Low Alloy Steel	Inside Air (external)	Crack initiation/growth due to fatigue.	None	IV.A1.7-a	3.1.1.1	A
Refueling Bellows Support Skirt	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Crack initiation/growth due to fatigue.	None	IV.A1.7-a	3.1.1.1	A
Stabilizer Bracket	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Crack initiation/growth due to fatigue.	None	IV.A1.7-a	3.1.1.1	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.
Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.
Note F Material not in NUREG-1801 item for this component.
Note G Environment not in NUREG-1801 item for this component and material.
Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.
Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Aging effects identified for this material/environment combination are consistent with industry guidance. Carbon and low alloy steels are not susceptible to external general corrosion when temperature is greater than 212°F.

2 Aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.1.2.2: Reactor Vessel Internals - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Nickel alloy	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-d	**3.1.1.32**	B
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Nickel alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-d	None	H, 1
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Nickel alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-f	None	H, 1
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Nickel alloy	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-f	**3.1.1.31**	B
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-a	None	H, 1
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-a	**3.1.1.31**	B
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program **(B.2.1.5)**	IV.B1.1-b	None	H, 1

Table 3.1.2.2: Reactor Vessel Internals - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.1-b	**3.1.1.31**	B
Reactor Vessel Internals Core Shroud and Core Plate	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.1-c	**3.1.1.1**	A
Reactor Vessel Internals Core Spray Lines and Spargers	PB, SPR, SS	Nickel alloy	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC). Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.3-a	None	F, 2
Reactor Vessel Internals Core Spray Lines and Spargers	PB, SPR, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.3-a	None	H, 1
Reactor Vessel Internals Core Spray Lines and Spargers	PB, SPR, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.3-a	**3.1.1.31**	B
Reactor Vessel Internals Core Spray Lines and Spargers	PB, SPR, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.3-b	**3.1.1.1**	A
Reactor Vessel Internals CRD Housing	PB, SS	Stainless Steel	Inside Air (external)	None	None	IV.B1.5-c	None	G, 2
Reactor Vessel Internals CRD Housing	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.5-c	None	H, 1

Table 3.1.2.2: Reactor Vessel Internals - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Internals CRD Housing	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.5-c	**3.1.1.31**	B
Reactor Vessel Internals Dry Tubes and Guide Tubes	PB, SS	Stainless Steel	Air/gas (internal)	None	None	IV.B1.6-a	None	G, 2
Reactor Vessel Internals Dry Tubes and Guide Tubes	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.6-a	None	H, 1
Reactor Vessel Internals Dry Tubes and Guide Tubes	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.6-b	**3.1.1.1**	A
Reactor Vessel Internals Dry Tubes and Guide Tubes	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IVB1.4-d	**3.1.1.31**	B
Reactor Vessel Internals Fuel Support	SS	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging and neutron irradiation embrittlement.	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) (**B.2.1.14**)	IV.B1.5-a	**3.1.1.33**	A
Reactor Vessel Internals Fuel Support	SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.5-a	None	H, 1
Reactor Vessel Internals Fuel Support	SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (**B.2.1.12**) Chemistry Control Program (**B.2.1.5**)	IV.B1.5-a	None	H, 1

Table 3.1.2.2: Reactor Vessel Internals - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Internals Fuel Support	SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.5-b	3.1.1.1	A
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Nickel alloy	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.4-b	3.1.1.1	A
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Nickel alloy	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (B.2.1.12) Chemistry Control Program (B.2.1.5)	IV-B1.4-a	3.1.1.31	B
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Nickel alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (B.2.1.12) Chemistry Control Program (B.2.1.5)	IV-B1.4-a	None	H, 1
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (B.2.1.12) Chemistry Control Program (B.2.1.5)	IV.B.1.4-a	3.1.1.31	B
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.4-b	3.1.1.1	A
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging and neutron irradiation embrittlement.	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) (B.2.1.14)	IV.B1.4-c	3.1.1.33	A
Reactor Vessel Internals Jet Pump Assemblies	PB, SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (B.2.1.12) Chemistry Control Program (B.2.1.5)	IV-B1.4-a	None	H, 1
Reactor Vessel Internals Top Guide	SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to stress corrosion cracking (SCC).	BWR Vessel Internals (B.2.1.12) Chemistry Control Program (B.2.1.5)	IV.B1.2-a	3.1.1.31	B

Table 3.1.2.2: Reactor Vessel Internals - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Vessel Internals Top Guide	SS	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	BWR Vessel Internals (B.2.1.12) Chemistry Control Program (B.2.1.5)	IV.B1.2-a	None	H, 1
Reactor Vessel Internals Top Guide	SS	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.B1.2-b	3.1.1.1	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Plant Specific Notes:

1 Additional aging effects identified for this material/environment combination are consistent with industry guidance.

2 Aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.1.2.3: Reactor Vessel Vents and Drains System (010) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion	Bolting Integrity Program (B.2.1.16)	VIII.H.2-a	3.4.1.8	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear	Bolting Integrity Program (B.2.1.16)	None	None	J, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program(B.2.1.29)	None	None	J, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VIII.H.1-b	3.4.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to general, crevice, pitting, and galvanic corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program(B.2.1.29)	VIII.H.1-b	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, crevice, pitting, and galvanic corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program(B.2.1.29)	None	None	J, 3, 4
Fittings	PB	Stainless Steel	Air/Gas (internal)	None	None	None	None	J, 5
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5
Fittings	PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program(B.2.1.29)	VIII.H.1-b	None	F, 3
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program(B.2.1.29)	None	None	J, 3, 4
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion	One-Time Inspection Program(B.2.1.29)	IV.C1.1-i	None	G, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.2.3: Reactor Vessel Vents and Drains System (010) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 6
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-i	None	H, 3
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV C1.1-i	None	H, 3
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 5
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3

Table 3.1.2.3: Reactor Vessel Vents and Drains System (010) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VIII.H.1-b	**3.4.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to general, crevice, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	VIII.H.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	None	None	J, 3, 4
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 5
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5
Piping	PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	VIII.H.1-b	None	F, 3
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	None	None	J, 3, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	G, 3

Table 3.1.2.3: Reactor Vessel Vents and Drains System (010) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 6
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-i	None	H, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3
Piping - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.1-i	None	G, 5
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-a	None	G, 5
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3

Table 3.1.2.3: Reactor Vessel Vents and Drains System (010) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VIII.H.1-b	3.4.1.5	A
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 5
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	IV.C1.3-a	None	G, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 6
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program(B.2.1.29)	IV.C1.3-a	None	H, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	IV.C1.3-a	3.1.1.25	A
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A
Valves - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.3-c	None	G, 5
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 5

Table 3.1.2.3: Reactor Vessel Vents and Drains System (010) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	IV.C1.3-c	None	H, 3
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) BWR Stress Corrosion Cracking Program (**B.2.1.10**) One-Time Inspection Program(**B.2.1.29**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A
Valves - RCPB	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.C1.3-b	**3.1.1.23**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 Consistent with industry guidance, wear is an aging mechanism that is only assigned to RCPB bolting.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 This item includes the main steam safety/relief valve blowdown lines to the suppression pool.

5 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

6 General corrosion is not an aging effect since the external temperature is above 212°F. This is consistent with industry guidance.

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (B.2.1.16)	IV.C1.2-d	3.1.1.26	F, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to stress relaxation.	Bolting Integrity Program (B.2.1.16)	IV.C1.2-e	None	F, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to fatigue.	None	IV.C1.2-f	None	F, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (B.2.1.16)	None	None	J, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 3
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 3
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (B.2.1.16)	IV.C1.2-d	3.1.1.26	B
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to stress relaxation.	Bolting Integrity Program (B.2.1.16)	IV.C1.2-e	3.1.1.26	B
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to fatigue.	None	IV.C1.2-f	3.1.1.1	A
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (B.2.1.16)	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 4
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 4
Bolting	MC, SS	Stainless Steel	Treated Water (external)	Loss of bolting function due to crevice and pitting corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	None	F, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 5
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 6

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Fittings	PB	Glass	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Fittings	PB	Glass	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	PB	Copper Alloy	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.C2.1-a	None	F, 2
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	VII.C2.1-a	None	F, 4
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	PB	Stainless Steel	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 6
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	B
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	H, 5
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 7, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 2, 8
Fittings - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 4, 8
Fittings - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (B.2.1.10) Chemistry Control Program (B.2.1.5)	IV.C1.1-f	3.1.1.29	B, 8

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-f	None	H, 2, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	3.1.1.1	A, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to (SCC).	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	B, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 2, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A, 8
Flexible Connectors	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Flexible Connectors	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Flexible Connectors	PB	Stainless Steel	Lubricating Oil (internal)	None	None	None	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Heat Exchangers	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	None	None	J, 2
Heat Exchangers	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Heat Exchangers	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 4
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 2
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 2
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Heat Exchangers	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Heat Exchangers	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Piping	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Piping	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Piping	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Piping	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.1-a	None	F, 2
Piping	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.1-a	None	F, 2
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 6
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 5
Piping - RCPB	PB	Stainless Steel	Air/gas (internal)	None	None	IV.C1.1-f	None	G, 4
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 4
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.1-f	**3.1.1.29**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	H, 2
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 2
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Pumps	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.3-a	None	G, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Pumps	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	VII.C2.3-a	None	G, 4
Reactor Coolant Pumps	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.2-b	None	G, 4

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reactor Coolant Pumps	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.2-a	3.1.1.1	A
Reactor Coolant Pumps	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.2-b	None	H, 2
Reactor Coolant Pumps	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (B.2.1.10) Chemistry Control Program (B.2.1.5)	IV.C1.2-b	3.1.1.29	B
Reactor Coolant Pumps	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4)	IV.C1.2-c	3.1.1.23	A
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.5-a	None	G, 4
Restricting Orifice	FR, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Restricting Orifice	FR, PB	Copper Alloy	Lubricating Oil (internal)	None	None	VII.C2.5-a	None	G, 4
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Restricting Orifice	FR, PB	Stainless Steel	Lubricating Oil (internal)	None	None	VII.C2.5-a	None	G, 4

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	D
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	H, 5
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	None	None	J, 4
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	D
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	C
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 2
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Strainers	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Strainers	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	None	None	J, 4
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.4-a	None	G, 2
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Tanks	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.4-a	None	G, 4
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Tubing	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 4
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 2
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 5

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.2-a	None	G, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	VII.C2.2-a	None	G, 4
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Copper Alloy	Lubricating Oil (internal)	None	None	VII.C2.2-a	None	G, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.2-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.2-a	None	F, 2
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Stainless Steel	Lubricating Oil (internal)	None	None	VII.C2.2-a	None	G, 4
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 5
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 6
Valves - RCPB	PB	Stainless Steel	Air/gas (internal)	None	None	IV.C1.3-c	None	G, 4
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 4
Valves - RCPB	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.C1.3-b	**3.1.1.23**	A

Table 3.1.2.4: Reactor Recirculation System (068) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	H, 2
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Chrome plated carbon steel bolting is used with the reactor water recirculation pumps. The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

4 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

5 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

6 Based on system design and operating history, MIC and biofouling are not applicable to the treated water portions of this system.

7 General corrosion is not an aging effect since the external temperature is above 212°F. This is consistent with industry guidance.

8 This item includes flow restrictors as well as fittings, thermowells, and flow elements. The intended function, FR – flow restriction, is only applicable to flow restrictors.

3.2 AGING MANAGEMENT OF ENGINEERED SAFETY FEATURES

3.2.1 Introduction

This section provides the results of the aging management review for those systems 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:

Section	System No.	System Name
2.3.2.1	064	Containment
2.3.2.2	065	Standby Gas Treatment
2.3.2.3	073	High Pressure Coolant Injection
2.3.2.4	074	Residual Heat Removal
2.3.2.5	075	Core Spray
2.3.2.6	076	Containment Inerting
2.3.2.7	084	Containment Atmosphere Dilution

Table **3.2.1**, Summary of Aging Management Evaluations in NUREG-1801 for Engineered Safety Features, provides the summary of the programs evaluated in NUREG-1801 for the Engineered Safety Features Systems component groups that are relied on for license renewal. This table uses the format described in Section **3.0**. Table 3.2.1 only provides results for those items that are applicable to a boiling water reactor (BWR). NUREG-1800 provides the basis for the further evaluation of the license renewal application to complete the summary of aging management evaluations in NUREG-1801 for plant specific considerations. When a further evaluation for Engineered Safety Features Systems is recommended by the NUREG-1801, that further evaluation is identified in Table 3.2.1 and the evaluation in accordance with the NUREG-1800 basis is provided in Section **3.2.2.2**.

3.2.2 Results

The following tables summarize the results of the aging management review for Engineered Safety Features Systems.

Table No.	System No.	System Name
3.2.2.1	064	Containment
3.2.2.2	065	Standby Gas Treatment
3.2.2.3	073	High Pressure Coolant Injection
3.2.2.4	074	Residual Heat Removal
3.2.2.5	075	Core Spray
3.2.2.6	076	Containment Inerting
3.2.2.7	084	Containment Atmosphere Dilution

The materials from which the specific 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 No.	System No.	System Name
3.2.2.1.1	064	Containment
3.2.2.1.2	065	Standby Gas Treatment
3.2.2.1.3	073	High Pressure Coolant Injection
3.2.2.1.4	074	Residual Heat Removal
3.2.2.1.5	075	Core Spray
3.2.2.1.6	076	Containment Inerting
3.2.2.1.7	084	Containment Atmosphere Dilution

3.2.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

3.2.2.1.1 Containment System (064)

Materials

The materials of construction for the Containment System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Copper alloy
- Elastomer
- Glass
- Nickel alloy
- Stainless steel
- Zinc alloy

Environment

The Containment System components are exposed to the following environments:

- Air/gas
- Buried
- Embedded/encased
- Inside air
- Outside Air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the Containment System, require management:

- Fouling due to biological and particulate buildup
- Hardening and loss of strength due to elastomer degradation (ultraviolet radiation)
- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, pitting, crevice, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Containment System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.2.2.1.2 Standby Gas Treatment System (065)

Materials

The materials of construction for the Standby Gas Treatment (SGT) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomer (Neoprene and silicone sealant)
- Polymers
- Stainless steel
- Zinc alloy

Environment

The SGT System components are exposed to the following environments:

- Air/gas
- Buried
- Inside air

Aging Effects Requiring Management

The following aging effects, associated with the SGT System, require management:

- Loss of bolting function due to general corrosion
- Loss of material due to MIC general, pitting, and crevice corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the SGT System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.2.2.1.3 High Pressure Coolant Injection System (073)

Materials

The materials of construction for the High Pressure Coolant Injection (HPCI) System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Glass
- Elastomer
- Nickel alloy
- Stainless steel

Environment

The HPCI System components are exposed to the following environments:

- Air/gas
- Inside air
- Lubricating oil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the HPCI System require management:

- Crack initiation and growth due to SCC, fatigue, and cyclic loading
- Elastomer degradation due to ultraviolet radiation, thermal exposure, and ionizing radiation
- Fouling due to particulate buildup
- Loss of bolting due to general corrosion and wear
- Loss of material due to flow-accelerated corrosion and selective leaching
- Loss of material due to general, crevice, pitting, and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the HPCI System components.

- ASME Section XI Subsections IWB, IWC, & IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.2.2.1.4 Residual Heat Removal System (074)

Materials

The materials of construction for the Residual Heat Removal (RHR) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The RHR System components are exposed to the following environments:

- Air/gas
- Inside Air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the RHR System, require management:

- Change in material properties/reduction in fracture toughness due to thermal aging
- Crack initiation and growth due to fatigue, SCC and cyclic loading
- Fouling due to biological and particulate buildup
- Loss of bolting function due to wear, crevice, pitting and general corrosion
- Loss of material due to MIC, selective leaching, biofouling, general, crevice, pitting and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the RHR System components.

- ASME Section XI Subsections IWB, IWC, & IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.2.2.1.5 Core Spray System (075)

Materials

The materials of construction for the Core Spray (CS) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Polymer
- Stainless Steel

Environment

The CS System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated Water

Aging Effects Requiring Management

The following aging effects associated with the CS System require management:

- Change in material properties/reduction in fracture toughness due to thermal aging
- Crack initiation and growth due to SCC, fatigue, and cyclic loading
- Loss of bolting function due to wear and general corrosion
- Loss of material due to selective leaching, general, crevice, pitting, and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the CS System components.

- ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.2.2.1.6 Containment Inerting System (076)

Materials

The materials of construction for the Containment Inerting System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Nickel alloy
- Stainless steel

Environment

The Containment Inerting System components are exposed to the following environments:

- Air/gas
- Inside air
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the Containment Inerting System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, crevice, and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Containment Inerting System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Systems Monitoring Program (**B.2.1.39**)

3.2.2.1.7 Containment Atmosphere Dilution System (084)

Materials

The materials of construction for the Containment Atmosphere Dilution (CAD) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The CAD System components are exposed to the following environments:

- Air/gas
- Buried
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the CAD System require management:

- Crack initiation and growth due to SCC
- Fouling product buildup due to particulate
- Loss of bolting function due to general corrosion
- Loss of material due to MIC, general, crevice, and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the CAD System components:

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

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 by the reviewer 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

Per NUREG-1800 paragraph 3.2.2.2.1, fatigue is a Time-Limited Aging Analysis (TLAA) as defined in 10 CFR 54.3. The TLAAs are required to be evaluated in accordance with 10 CFR 54.21(c). The evaluation of this TLAA is addressed separately in Section **4.3.3**.

3.2.2.2.2 Loss of Material due to General Corrosion

1. BFN will implement a One-Time Inspection Program (Section **B.2.1.29**) to verify the effectiveness of the Chemistry Control Program (Section **B.2.1.5**) at managing the loss of material due to general corrosion.

2. Loss of material due to general corrosion of the portions of Engineered Safety Features Systems filled with treated water is managed by the Chemistry Control Program (Section **B.2.1.5**) and the One-Time Inspection Program (Section **B.2.1.29**) as discussed in item 1 above. Loss of material due to general corrosion of the air/gas portions of these systems is managed by the One-Time Inspection Program (Section **B.2.1.29**) for internal surfaces. General corrosion of external surfaces is managed by the System Monitoring Program (Section **B.2.1.39**).

3.2.2.2.3 Local Loss of Material due to Pitting and Crevice Corrosion

1. BFN will implement a One-Time Inspection Program (Section **B.2.1.29**) to verify the effectiveness of the Chemistry Control Program (Section **B.2.1.5**) at managing the loss of material due to pitting and crevice corrosion.

2. Loss of material due to pitting and crevice corrosion for the portions of Engineered Safety Features Systems filled with treated water is managed by the Chemistry Control Program (Section **B.2.1.5**) and the One-Time Inspection Program (Section **B.2.1.29**) as discussed in item 1 above. Loss of material due to pitting and crevice corrosion of the air/gas portions of these systems is managed by the One-Time Inspection Program (Section **B.2.1.29**), where these aging mechanisms are identified.

3.2.2.2.4 Local Loss of Material due to Microbiologically Influenced Corrosion

BFN considers microbiologically influenced corrosion (MIC) to be an aging mechanism for systems with raw water as the environment. BFN has no systems containing raw water that penetrate primary containment. Several raw water systems penetrate secondary containment. BFN utilizes the Open Cycle Cooling Water Program (Section **B.2.1.17**) to manage the aging effects that could be caused by MIC in these systems.

3.2.2.2.5 Changes in Properties due to Elastomer Degradation

The normal operating temperature of the SGT System is less than the defined limits for hardening and loss of strength of installed elastomers. See Table **3.2.2.2** for the AMR results.

3.2.2.2.6 Local Loss of Material due to Erosion

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.2.2.2.7 Buildup of Deposits due to Corrosion

BFN spray nozzles are brass and are not susceptible to general corrosion. There are no orifices susceptible to general corrosion that are occasionally wetted in the Engineered Safety Features Systems.

3.2.2.2.8 Quality Assurance for Aging Management of Nonsafety-Related Components

See section **B.1.3** of this application for further discussion.

3.2.2.3 Time-Limited Aging Analysis

The TLAAs identified for Engineered Safety Features:

- Piping and Component Fatigue Analysis (Section **4.3.3**)
- Dose to Seal Rings for HPCI and RCIC Containment Isolation Check Valves (Section **4.7.3**)

3.2.3 Conclusion

The ESF piping, fittings, and 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 ESF components are identified in the summary tables and Section **3.2.2.1.**

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 ESF 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.

Table 3.2.1 Summary of Aging Management Evaluations for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.1	Piping, fittings and valves in emergency core cooling system	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR54.21(c)	Yes, TLAA	Consistent with NUREG-1801. See discussion in Section **3.2.2.2.1**. See discussion of TLAA in Section **4.3.**
3.2.1.2	Piping, fittings, pumps and valves in emergency core cooling system	Loss of material due to general corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801 with exceptions. See discussion in Section **3.2.2.2.2**. See description of AMP in Section **B.2.1.5.**
3.2.1.3	Components in containment spray (PWR only), standby gas treatment system (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to general corrosion	Plant specific	Yes, plant specific	See discussion in Section **3.2.2.2.2.**
3.2.1.4	Piping, fittings, pumps and valves in emergency core cooling system	Loss of material due to pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is be further evaluated	Consistent with NUREG-1801 with exceptions. See discussion in section **3.2.2.2.3.** See description of AMP in section **B.2.1.5.** and **B.2.1.29**
3.2.1.5	Components in containment spray (PWR only), standby gas treatment system (BWR only), containment isolation, and emergency core cooling systems	Loss of material due to pitting and crevice corrosion	Plant specific	Yes, plant specific	See discussion in section **3.2.2.2.3.**
3.2.1.6	Containment isolation valves and associated piping	Loss of material due to microbiologically influenced corrosion (MIC)	Plant specific	Yes, plant specific	See discussion in section **3.2.2.2.4.**
3.2.1.7	Seals in standby gas treatment system	Changes in properties due to elastomer degradation	Plant specific	Yes, plant specific	See discussion in section **3.2.2.2.5.**
3.2.1.8	PWR only.				

Table 3.2.1 Summary of Aging Management Evaluations for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.9	Drywell and suppression chamber spray system nozzles and flow orifices	Plugging of nozzles and flow orifices by general corrosion products	Plant specific	Yes, plant specific	See discussion in section **3.2.2.2.7.** .
3.2.1.10	External surface of carbon steel components	Loss of material due to general corrosion	Plant specific	Yes, plant specific	See discussion in section **3.2.2.2.2.** See description of AMP in section **B.2.1.39.**
3.2.1.11	Piping and fittings of CASS in emergency core cooling systems	Loss of fracture toughness due to thermal aging embrittlement	Thermal aging embrittlement of CASS	No	BFN does not require a Thermal Aging Embrittlement of CASS AMP. See discussion of AMP in section **B.2.1.13**.
3.2.1.12	Components serviced by open-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	No	Consistent with NUREG-1801. See description of AMP in section **B.2.1.17.**
3.2.1.13	Components serviced by closed-cycle cooling system	Loss of material due to general, pitting, and crevice corrosion	Closed-cycle cooling water system	No	Consistent with NUREG-1801. See discussion of AMP in section **B.2.1.18.**
3.2.1.14	Emergency core cooling system valves and lines to and from high pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) pump turbines	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No	See description of AMP in section **B.2.1.15.**
3.2.1.15	PWR only.				
3.2.1.16	Pumps, valves, piping and fittings in emergency core cooling system	Crack initiation and growth due to SCC and IGSCC	Water chemistry and BWR stress corrosion cracking	No	Consistent with NUREG-1801 with exceptions. See description of AMP in section **B.2.1.5** and **B.2.1.10**
3.2.1.17	PWR only.				

Table 3.2.1 Summary of Aging Management Evaluations for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1.18	Closure bolting in high-pressure or high-temperature systems	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC	Bolting integrity	No	Consistent with NUREG-1801 with exceptions. See description of AMP in section **B.2.1.16.**

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Nickel Alloy	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Bolting	MC, SS	Stainless Steel	Outside Air (external)	None	None	V.E.2-a	None	F, 2
Ductwork	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Ductwork	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Ductwork	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Ductwork	PB	Elastomer	Air/gas (internal)	None	None	None	None	J, 2
Ductwork	PB	Elastomers	Inside Air (external) Outside Air (external)	Hardening and loss of strength due to elastomer degradation (ultraviolet radiation)	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 3
Ductwork	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Ductwork	PB	Zinc Alloy	Air/gas (internal)	None	None	None	None	J, 2
Ductwork	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Ductwork	PB	Zinc Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Ductwork	PB	Aluminum Alloy	Outside Air (external)	None	None	V.E.1-b	None	F, 2
Ductwork	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Fire Dampers	FB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Fire Dampers	FB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	V.E.1-b	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Embedded/ encased (external)	None	None	V.E.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Glass	Air/gas (internal), Treated Water (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	F, 3
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Flexible Connectors	PB	Nickel Alloy	Air/gas (internal)	None	None	None	None	J, 2
Flexible Connectors	PB	Nickel Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Flexible Connectors	PB	Nickel Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Flexible Connectors	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	D
Heat Exchangers	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	H, 3
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	C
Heat Exchangers	HT, PB	Aluminum Alloy	Air/gas (internal)	Fouling due to particulate buildup.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal)	Fouling due to particulate buildup.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Heat Exchangers	HT, PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Heat Exchangers	HT, PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Fouling due to biological and particulate build up. Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	V.E.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Embedded/ encased (external)	None	None	V.E.1-b	None	G, 2

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to galvanic, crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 4
Strainers	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Strainers	DP, PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Strainers	DP, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Traps	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Traps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	D

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 5
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B

Table 3.2.2.1: Containment System (064) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 4

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.
2. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.
3. The aging effects identified for this material/environment combination are consistent with industry guidance.
4. Based on system design and operating history, MIC and biofouling was determined to be not applicable to the treated water portions of this system.

Table 3.2.2.2: Standby Gas Treatment System (065) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Copper Alloy	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Ductwork	PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.B.1-a	**3.2.1.3**	A
Ductwork	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Ductwork	PB, SS	Elastomers - Neoprene	Air/gas (internal)	None	None	V.B.1-b	None	I, 3
Ductwork	PB, SS	Elastomers - Neoprene	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Ductwork	PB, SS	Aluminum Alloy	Air/gas (internal)	None	None	V.B.1-a	None	F, 4
Ductwork	PB, SS	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Ductwork	PB, SS	Stainless Steel	Air/gas (internal)	None	None	V.B.1-a	None	F, 4
Ductwork	PB, SS	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.B.1-a	**3.2.1.3**	A, 2
Fittings	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, general, pitting, and crevice corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	V.E.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.2: Standby Gas Treatment System (065) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Cast Iron and Cast Iron Alloys	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 2
Fittings	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 2
Fittings	PB	Elastomers - Silicon sealant	Air/gas (internal)	None	None	None	None	J, 3
Fittings	PB	Elastomers - Silicon sealant	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 3
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Polymers	Air/gas (internal)	None	None	None	None	J, 4
Fittings	PB	Polymers	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings - test ports	PB	Zinc Alloys	Air/gas (internal)	None	None	None	None	J, 4
Fittings - test ports	PB	Zinc Alloys	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Flexible Connectors	PB	Elastomers - Neoprene	Air/gas (internal)	None	None	V.B.1-b	None	I, 3
Flexible Connectors	PB	Elastomers - Neoprene	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.B.1-a	3.2.1.3	C, 2

Table 3.2.2.2: Standby Gas Treatment System (065) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, general, pitting, and crevice corrosion.	Buried Piping and Tanks Inspection Program (B.2.1.31)	V.E.1-b	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 4
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.B.1-a	3.2.1.3	C, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note E Consistent with NUREG-1801 item for material, environment, and aging effect, a different aging management program is credited.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 The normal operating temperature for the Standby Gas Treatment system is less than the defined limits for hardening and loss of strength.

4 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 2
Condenser	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Condenser	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Condenser	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Condenser	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 4
Condenser	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Condenser	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Expansion Joint	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 5

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	C, 6
Expansion Joint	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Expansion Joint	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D
Expansion Joint	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	V.D2.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 5
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to galvanic, crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	V.D2.1-b	**3.2.1.1**	A, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	A
Fittings	PB	Cast Iron and Cast Iron Alloys	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 3
Fittings	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Fittings	PB	Glass	Lubricating Oil (internal)	None	None	None	None	J, 4
Fittings	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Copper Alloy	Lubricating Oil (internal)	None	None	V.D2.1-a	None	G, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice corrosion, galvanic corrosion, pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 3
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.1-a	None	F, 3
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	G, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Stainless Steel	Lubricating Oil (internal)	None	None	V.D2.1-c	None	G, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	V.D2.1-b	**3.2.1.1**	A

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 3
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	B
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.D2.1-d	None	I, 6
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-a	None	G, 7, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C.1.1-i	**3.1.1.7**	A, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-a	**3.1.1.25**	A, 6, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	H, 5, 8
Fittings - RCPB	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-e	**3.1.1.1**	A, 8
Fittings - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4, 8

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 3, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	B, 8
Flexible Connectors	PB	Elastomer	Air/gas (internal)	None	None	None	None	J, 4
Flexible Connectors	PB	Elastomer	Inside Air (external)	Elastomer degradation due to ultraviolet radiation.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 3
Flexible Connectors	PB	Non- ferrous-Nickel Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Flexible Connectors	PB	Non- ferrous-Nickel Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Flexible Connectors	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Flexible Connectors	PB	Stainless Steel	Lubricating Oil (internal)	None	None	None	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Gland Seal Blower	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Gland Seal Blower	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Heat Exchangers	HT, PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 4
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Fouling product buildup due to particulates Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	V.D2.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 5
Piping	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to galvanic, crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 3

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	V.D2.1-b	**3.2.1.1**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	A, 6
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	G, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	V.D2.1-b	**3.2.1.1**	A
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	B
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 3
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.D2.1-d	None	I, 6
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	G, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	G, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 7

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-a	**3.1.1.25**	A, 6
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	H, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-e	**3.1.1.1**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	**3.2.1.2, 3.2.1.4**	B
Pumps	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Lubricating Oil (internal)	None	None	None	None	J, 4
Pumps	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.2-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Restricting Orifice	FR, PB	Stainless Steel	Lubricating Oil (internal)	None	None	V.D2.1-c	None	G, 4

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.1-c	None	H, 3
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (B.2.1.10) Chemistry Control Program (B.2.1.5)	V.D2.1-c	3.2.1.16	D
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	D
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	None	None	J, 4
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 3
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	C
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	DP, PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Strainers	DP, PB	Cast Iron and Cast Iron Alloys	Lubricating Oil (internal)	None	None	None	None	J, 4
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tanks	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Traps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	C, 6
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Stainless Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 3
Turbines	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Turbines	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	V.D2.3-b	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.3-a	**3.2.1.14**	A, 6
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	**3.2.1.2, 3.2.1.4**	B
Valves	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloys	Lubricating Oil (internal)	None	None	V.D2.3-b	None	G, 4

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Copper Alloy	Lubricating Oil (internal)	None	None	V.D2.3-b	None	G, 4
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.3-c	None	G, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Stainless Steel	Lubricating Oil (internal)	None	None	V.D2.3-c	None	G, 4
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-c	None	H, 5
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.3-c	**3.2.1.16**	B
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-a	None	G, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 7
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.3-a	**3.1.1.25**	A, 6
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-a	None	H, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.3: High Pressure Coolant Injection System (073) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (B.2.1.10) Chemistry Control Program (B.2.1.5)	IV C1.3-c	3.1.1.29	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.3-c	None	H, 5
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A,

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material, and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. Consistent with industry guidance, wear is an aging mechanism that is only assigned to RCPB bolting.
2. High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.
3. The aging effects identified for this material/environment combination are consistent with industry guidance.
4. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.
5. The additional aging effects identified for this material/environment combination are consistent with industry guidance.
6. The identified aging mechanism is applicable to the turbine steam supply line and the turbine exhaust.
7. The aging effects and AMP identified for this material/environment combination are consistent with industry guidance. Carbon and low alloy steels are not susceptible to external general corrosion when temperature is greater than 212°F.
8. This item includes flow restrictors as well as fittings, thermowells, and flow elements. The intended function, FR – flow restriction, is only applicable to flow restrictors.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 3
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 4
Bolting	MC, SS	Stainless Steel	Treated Water (external)	Loss of bolting function due to crevice and pitting corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	None	F, 3
Fittings	SPR, FR, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.1-a	None	G, 3, 6
Fittings	SPR, FR, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.5-a	**3.2.1.3**	A, 6
Fittings	SPR, FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A, 6
Fittings	SPR, FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-a	None	H, 3, 6
Fittings	SPR, FR, PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to galvanic, crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.E.1-b	None	G, 3, 6

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	SPR, FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B, 6
Fittings	SPR, FR, PB	Copper Alloy	Air/gas (internal)	None	None	V.D2.1-c	None	F, 4, 6
Fittings	SPR, FR, PB	Copper Alloy	Air/gas (internal)	None	None	V.D2.5-a	None	F, 4, 6
Fittings	SPR, FR, PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4, 6
Fittings	SPR, FR, PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4, 6
Fittings	SPR, FR, PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-c	None	F, 3, 6
Fittings	SPR, FR, PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.1-c	None	F, 3, 6
Fittings	SPR, FR, PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-c	None	F, 3, 6
Fittings	SPR, FR, PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	G, 4, 6
Fittings	SPR, FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4, 6
Fittings	SPR, FR, PB	Stainless Steel	Treated Water (external)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.E.1-b	None	F, 3, 6
Fittings	SPR, FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	B, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	SPR, FR, PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.E.1-b	None	F, 3, 6
Fittings	SPR, FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-c	None	H, 3, 6
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-f	None	F, 1
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-f	None	F, 3
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 4
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-f	None	H, 3
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.1-f	**3.1.1.29**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	None	None	IV.C1.1-g	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	3.1.1.1	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	IV.C1.1-i	3.1.1.7	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	IV.C1.1-i	None	H, 3
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.D2.4-a	3.2.1.12	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.D2.4-a	None	H, 3
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	None	None	V.D2.4-b	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.4-a	None	E, 3
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.4-a	None	H, 3
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloys	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.D2.4-a	None	F, 3
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloys	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.4-a	None	H, 3
Heat Exchangers	HT, PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.D2.4-a	**3.2.1.12**	A
Heat Exchangers	HT, PB	Stainless Steel	Raw Water (internal)	Fouling product buildup due to particulate.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.D2.4-b	None	H, 3
Heat Exchangers	HT, PB	Stainless Steel	Raw Water (internal)	Fouling product buildup due to biological.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.D2.4-b	**3.2.1.12**	A
Heat Exchangers	HT, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.4-a	None	H, 3
Heat Exchangers	HT, PB	Stainless Steel	Treated Water (internal)	Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.4-a	None	E, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.5-a	**3.2.1.3**	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-a	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to galvanic, crevice, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.E.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	G, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-c	None	H, 3
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	B

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	IV.C1.1-f	None	F, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-f	None	F, 1
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-f	None	F, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 4
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.1-f	**3.1.1.29**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-f	None	H, 3
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	H, 3
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.2-a	**3.2.1.2, 3.2.1.4**	B
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.2-a	None	H, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.2-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.2-a	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (external)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (B.2.1.10) Chemistry Control Program (B.2.1.5)	V.E.1-b	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (B.2.1.10) Chemistry Control Program (B.2.1.5)	V.D2.1-c	3.2.1.16	D
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	V.E.1-b	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	V.D2.1-c	None	H, 3
Strainers	DP, PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 3
Strainers	DP, PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	None	None	J, 3
Strainers	DP, PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 3
Strainers	DP, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Strainers	DP, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	V.D2.1-c	None	H, 3
Strainers	DP, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (B.2.1.10) Chemistry Control Program (B.2.1.5)	V.D2.1-c	3.2.1.16	D
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.1-c	None	H, 3
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.3-b	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.3-b	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.3-b	**3.2.1.2, 3.2.1.4**	B
Valves	PB	Cast Iron and Cast Iron Alloys	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.3-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	V.D2.3-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.3-c	None	G, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (B.2.1.10) Chemistry Control Program (B.2.1.5)	V.D2.3-c	3.2.1.16	B
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	V.D2.3-c	None	H, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (B.2.1.29)	IV.C1.3-a	None	G, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 1
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection (B.2.1.29)	IV.C1.3-a	None	H, 3
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-b	None	G, 4
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (B.2.1.10) Chemistry Control Program (B.2.1.5)	IV C1.3-c	3.1.1.29	B
Valves - RCPB	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4)	IV.C1.3-b	3.1.1.23	A

Table 3.2.2.4: Residual Heat Removal System (074) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection (**B.2.1.29**)	IV.C1.3-c	None	H, 3
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 General Corrosion is not an aging effect since the external temperature is above 212°F. This is consistent with industry guidance documents.

2 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

3 Aging effects identified for this material/environment combination are consistent with industry guidance.

4 There are no applicable aging effects for this material and environment combination. This is consistent with industry guidance.

5 Carbon steel heat exchanger components in the RHR System are not heat transfer surfaces, therefore fouling is not a concern.

6 This item includes flow restrictors, spray nozzles, as well as fittings, thermowells, and flow elements. The intended function, FR – flow restriction, is only applicable to the flow restrictors. The intended function, SPR – spray, is only applicable to the spray nozzles.

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 2
Fittings	FR, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 3, 8
Fittings	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A, 8
Fittings	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B, 8
Fittings	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program **(B.2.1.5)** One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 4, 8
Fittings	FR, PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 5, 8
Fittings	FR, PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 3, 8
Fittings	FR, PB	Stainless Steel	Air/Gas (internal)	None	None	V.D2.1-a	None	F, 5, 8
Fittings	FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5, 8
Fittings	FR, PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	F, 3, 8

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	F, 3, 8
Fittings	FR, PB	Stainless Steel	Treated Water (internal)	None	None	V.D2.1-c	None	I, 6, 8
Fittings - RCPB (F.5)	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-f	None	F, 7
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 7
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Fittings - RCPB (F.5)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-f	None	F, 3
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	3.1.1.1	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 3
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 3

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B
Piping	FR, PB	Stainless Steel	Air/Gas (internal)	None	None	V.D2.1-a	None	F, 5
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program **(B.2.1.5)** One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 3
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.D2.1-c	None	I, 6
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	F, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	F, 3
Piping - RCPB (**F.5**)	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G,7
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 7
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping - RCPB (**F.5**)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	3.1.1.1	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 3
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 5
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	3.1.1.1	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 3
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.2-a	3.2.1.2, 3.2.1.4	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Pumps	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 5
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	D
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	C
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Strainers	DP, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Strainers	DP, PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	F, 3
Strainers	DP, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Tubing	PB	Polymer	Air/Gas (internal)	None	None	V.D2.1-a	None	F, 5
Tubing	PB	Polymer	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	**3.2.1.2, 3.2.1.4**	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	H, 4
Valves	PB	Cast Iron and Cast Iron Alloys	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.D2.3-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5

Table 3.2.2.5: Core Spray System (075) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.3-b	None	F, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	IV.C1.3-c	None	F, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-c	None	F, 7
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.3-c	None	F, 3
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 5
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.3-c	3.1.1.29	B
Valves - RCPB	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4)	IV.C1.3-b	3.1.1.23	A
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.3-c	None	H, 3
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Consistent with industry guidance, wear is an aging mechanism that is only assigned to RCPB bolting.

2 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 The additional aging effects identified for this material/environment combination are consistent with other NUREG-1801 Sections.

5 There are no applicable aging effects for this material and environment combination. This is consistent with industry guidance.

6 The stainless steel components not within the RCPB portions for the CS System have a normal operating temperature < 140°F. Therefore, SCC is not an aging effect requiring management.

7 There are no applicable aging effects for this material and environment combination. Carbon and low alloy steels are not susceptible to external general corrosion when the temperature is greater than 212°F.

8 This item includes fittings, thermowells, and flow elements. The intended function, FR - flow restriction, is only applicable to the flow elements.

Table 3.2.2.6: Containment Inerting System (076) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Fittings	PB	Cast Iron and Cast Iron Alloys	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	F, 3
Fittings	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 3
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.C.1-b	3.2.1.5, 3.2.1.6	A
Flexible Connectors	PB	Nickel Alloy	Air/gas (internal)	None	None	None	None	J, 2
Flexible Connectors	PB	Nickel Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Heat Exchangers	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Heat Exchangers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.6: Containment Inerting System (076) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.C.1-b	3.2.1.5, 3.2.1.6	C
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Pumps	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Pumps	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Strainers	DP, PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Strainers	DP, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Traps	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Traps	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.2.2.6: Containment Inerting System (076) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5** **3.2.1.6**	C
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Aluminum Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.2.2.7: Containment Atmosphere Dilution System (084) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Bolting	MC, SS	Stainless Steel	Outside Air (external)	None	None	V.E.2-a	None	F, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Cast Iron and Cast Iron Alloys	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	V.C.1-a	None	F, 3
Fittings	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Fittings	PB	Stainless Steel	Buried (external)	Crack initiation/growth due to SCC. Loss of material due to MIC, crevice and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	V.E.1-b	None	F, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Outside Air (external)	None	None	V.E.1-b	None	F, 2
Flex Hose	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB

Table 3.2.2.7: Containment Atmosphere Dilution System (084) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flex Hose	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Heat Exchangers	PB	Stainless Steel	Air/gas (internal)	Fouling product buildup due to particulate.	One-Time Inspection (B.2.1.29)	None	None	J, 3
Heat Exchangers	PB	Stainless Steel	Outside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (B.2.1.29)	V.C.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Piping	PB	Stainless Steel	Buried (external)	Crack initiation/growth due to SCC. Loss of material due to MIC, crevice and pitting corrosion.	Buried Piping and Tanks Inspection Program (B.2.1.31)	V.E.1-b	None	F, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Outside Air (external)	None	None	V.E.1-b	None	F, 2
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (B.2.1.29)	None	None	J, 3
Tanks	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Tanks	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Tanks	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Copper Alloy	Outside Air (external)	None	None	V.E.1-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB

Table 3.2.2.7: Containment Atmosphere Dilution System (084) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Outside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Aluminum Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Outside Air (external)	None	None	V.E.1-b	None	F, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

3.3 AGING MANAGEMENT OF AUXILIARY SYSTEMS

3.3.1 Introduction

This section provides the results of the aging management review for those systems identified in Section 2.3.3, Auxiliary 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:

Section	System No.	System Name
2.3.3.1	012	Auxiliary Boiler
2.3.3.2	018	Fuel Oil
2.3.3.3	023	Residual Heat Removal Service Water
2.3.3.4	024	Raw Cooling Water
2.3.3.5	025	Raw Service Water
2.3.3.6	026	High Pressure Fire Protection
2.3.3.7	029	Potable Water
2.3.3.8	030	Ventilation
2.3.3.9	031	Heating, Ventilation, and Air Conditioning
2.3.3.10	032	Control Air
2.3.3.11	033	Service Air
2.3.3.12	039	CO_2
2.3.3.13	040	Station Drainage
2.3.3.14	043	Sampling and Water Quality
2.3.3.15	044	Building Heat
2.3.3.16	050	Raw Water Chemical Treatment
2.3.3.17	053	Demineralizer Backwash Air
2.3.3.18	063	Standby Liquid Control
2.3.3.19	066	Off-Gas
2.3.3.20	067	Emergency Equipment Cooling Water
2.3.3.21	069	Reactor Water Cleanup
2.3.3.22	070	Reactor Building Closed Cooling Water

Section	System No.	System Name
2.3.3.23	071	Reactor Core Isolation Cooling
2.3.3.24	072	Auxiliary Decay Heat Removal
2.3.3.25	077	Radioactive Waste Treatment
2.3.3.26	078	Fuel Pool Cooling and Cleanup
2.3.3.27	079	Fuel Handling and Storage
2.3.3.28	082	Diesel Generator
2.3.3.29	085	Control Rod Drive
2.3.3.30	086	Diesel Generator Starting Air
2.3.3.31	090	Radiation Monitoring
2.3.3.32	092	Neutron Monitoring
2.3.3.33	094	Traversing In-Core Probe
2.3.3.34	111	Cranes

Table 3.3.1, Summary of Aging Management Evaluations in NUREG-1801 for Auxiliary Systems, provides the summary of the programs evaluated in NUREG-1801 for the Auxiliary Systems component groups that are relied on for license renewal. This table uses the format described in Section 3.0. Table 3.3.1 only provides results for those items that are applicable to a BWR. NUREG-1800 provides the basis for the further evaluation of the license renewal application to complete the summary of aging management evaluations in NUREG-1801 for plant specific considerations. When a further evaluation for Auxiliary Systems is recommended by the NUREG-1801, that further evaluation is identified in Table 3.3.1 and the evaluation in accordance with the NUREG-1800 basis is provided in Section 3.3.2.2.

3.3.2 Results

The following tables summarize the results of the aging management review for systems in the Auxiliary Systems group.

Table	System No.	System Name
3.3.2.1	012	Auxiliary Boiler
3.3.2.2	018	Fuel Oil
3.3.2.3	023	Residual Heat Removal Service Water
3.3.2.4	024	Raw Cooling Water

Table	**System No.**	**System Name**
3.3.2.5	025	Raw Service Water
3.3.2.6	026	High Pressure Fire Protection
3.3.2.7	029	Potable Water
3.3.2.8	030	Ventilation
3.3.2.9	031	Heating, Ventilation, and Air Conditioning
3.3.2.10	032	Control Air
3.3.2.11	033	Service Air
3.3.2.12	039	CO_2
3.3.2.13	040	Station Drainage
3.3.2.14	043	Sampling and Water Quality
3.3.2.15	044	Building Heat
3.3.2.16	050	Raw Water Chemical Treatment
3.3.2.17	053	Demineralizer Backwash Air
3.3.2.18	063	Standby Liquid Control
3.3.2.19	066	Off-Gas
3.3.2.20	067	Emergency Equipment Cooling Water
3.3.2.21	069	Reactor Water Cleanup
3.3.2.22	070	Reactor Building Closed Cooling Water
3.3.2.23	071	Reactor Core Isolation Cooling
3.3.2.24	072	Auxiliary Decay Heat Removal
3.3.2.25	077	Radioactive Waste Treatment
3.3.2.26	078	Fuel Pool Cooling and Cleanup
3.3.2.27	079	Fuel Handling and Storage
3.3.2.28	082	Diesel Generator
3.3.2.29	085	Control Rod Drive
3.3.2.30	086	Diesel Generator Starting Air
3.3.2.31	090	Radiation Monitoring
3.3.2.32	092	Neutron Monitoring

Table	System No.	System Name
3.3.2.33	094	Traversing In-Core Probe
3.3.2.34	111	Cranes

The materials from which the specific 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	System No.	System Name
3.3.2.1.1	012	Auxiliary Boiler
3.3.2.1.2	018	Fuel Oil
3.3.2.1.3	023	Residual Heat Removal Service Water
3.3.2.1.4	024	Raw Cooling Water
3.3.2.1.5	025	Raw Service Water
3.3.2.1.6	026	High Pressure Fire Protection
3.3.2.1.7	029	Potable Water
3.3.2.1.8	030	Ventilation
3.3.2.1.9	031	Heating, Ventilation, and Air Conditioning
3.3.2.1.10	032	Control Air
3.3.2.1.11	033	Service Air
3.3.2.1.12	039	CO_2
3.3.2.1.13	040	Station Drainage
3.3.2.1.14	043	Sampling and Water Quality
3.3.2.1.15	044	Building Heat
3.3.2.1.16	050	Raw Water Chemical Treatment
3.3.2.1.17	053	Demineralizer Backwash Air
3.3.2.1.18	063	Standby Liquid Control
3.3.2.1.19	066	Off-Gas
3.3.2.1.20	067	Emergency Equipment Cooling Water
3.3.2.1.21	069	Reactor Water Cleanup

Section	System No.	System Name
3.3.2.1.22	070	Reactor Building Closed Cooling Water
3.3.2.1.23	071	Reactor Core Isolation Cooling
3.3.2.1.24	072	Auxiliary Decay Heat Removal
3.3.2.1.25	077	Radioactive Waste Treatment
3.3.2.1.26	078	Fuel Pool Cooling and Cleanup
3.3.2.1.27	079	Fuel Handling and Storage
3.3.2.1.28	082	Diesel Generator
3.3.2.1.29	085	Control Rod Drive
3.3.2.1.30	086	Diesel Generator Starting Air
3.3.2.1.31	090	Radiation Monitoring
3.3.2.1.32	092	Neutron Monitoring
3.3.2.1.33	094	Traversing In-Core Probe
3.3.2.1.34	111	Cranes

3.3.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

3.3.2.1.1 Auxiliary Boiler System (012)

Materials

The materials of construction for the Auxiliary Boiler System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The Auxiliary Boiler System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Auxiliary Boiler System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Auxiliary Boiler System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.2 Fuel Oil System (018)

Materials

The materials of construction for the Fuel Oil System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomer
- Nickel alloy
- Stainless steel

Environment

The Fuel Oil System components are exposed to the following environments:

- Air/gas
- Buried
- Embedded/encased
- Fuel oil
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Fuel Oil System require management:

- Elastomer degradation due to ultraviolet radiation and oxidation
- Loss of bolting function due to general corrosion
- Loss of material due to MIC, general, crevice and pitting corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Fuel Oil System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- Fuel Oil Chemistry Program (**B.2.1.27**)
- One-time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.3 Residual Heat Removal Service Water System (023)

Materials

The materials of construction for the Residual Heat Removal Service Water (RHRSW) System components are:

- Aluminum alloy
- Copper Alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Polymer
- Stainless steel

Environment

The RHRWS System components are exposed to the following environments:

- Air/gas
- Buried
- Embedded/encased
- Inside Air
- Outside Air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the RHRSW System require management:

- Crack initiation and growth due to stress corrosion
- Loss of bolting function due to MIC, general, crevice, and pitting corrosion
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the RHRSW System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water Program **(B.2.1.17)**
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.4 Raw Cooling Water System (024)

Materials

The materials of construction for the Raw Cooling Water (RCW) System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomer
- Polymer
- Stainless steel

Environment

The RCW System components are exposed to the following environments:

- Air and gas
- Inside air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the RCW System require management:

- Crack initiation and growth due to stress corrosion
- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the RCW System components.

- Bolting Integrity Program (**B.2.1.16**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18***)*
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.5 Raw Service Water System (025)

Materials

The materials of construction for the Raw Service Water (RSW) System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy,
- Copper alloy
- Stainless steel

Environment

The RSW System components are exposed to the following environments:

- Air/gas
- Buried
- Inside air
- Outside air
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the RSW System require management:

- Loss of bolting function due to general corrosion.
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Raw Service Water System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.6 High Pressure Fire Protection System (026)

Materials

The materials of construction for the High Pressure Fire Protection (HPFP) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomers
- Glass
- Nickel alloy
- Stainless steel

Environment

The HPFP System components are exposed to the following environments:

- Air/gas
- Buried
- Aqueous film-forming foam
- Inside air
- Outside air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the HPFP System require management:

- Crack initiation and growth due to stress corrosion
- Elastomer degradation/deterioration due to ultraviolet radiation
- Loss of bolting function due to MIC, selective leaching, crevice, pitting and general corrosion
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the HPFP System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- Chemistry Control Program (**B.2.1.5**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- Fire Water System Program (**B.2.1.24**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.7 Potable Water System (029)

Materials

The materials of construction for the Potable Water System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy - gray
- Copper alloy
- Stainless steel

Environment

The Potable Water System components are exposed to the following environments:

- Inside air
- Outside air
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the Potable Water System require management:

- Crack initiation and growth due to stress corrosion
- Loss of bolting function due to general corrosion
- Loss of material due to general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Potable Water System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.8 Ventilation System (030)

Materials

The materials of construction for the Ventilation System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Elastomer (rubber and silicone)
- Stainless steel
- Zinc alloy

Environment

The Ventilation System components are exposed to the following environments:

- Air/gas
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Ventilation System require management:

- Elastomer degradation due to ultraviolet radiation
- Loss of bolting function due to general corrosion
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Ventilation System components.

- Bolting Integrity Program (**B.2.1.16**)
- Fire Protection Program (**B.2.1.23**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.9 Heating, Ventilation, and Air Conditioning System (031)

Materials

The materials of construction for the Heating, Ventilation, and Air Conditioning (HVAC) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomers (Neoprene, fiberglass and silicon)
- Glass
- Polymers (Nylon and plastic)
- Stainless steel

Environment

The HVAC System components are exposed to the following environments:

- Air/gas
- Inside air
- Lubricating oil
- Outside air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the HVAC System require management:

- Crack initiation and growth due to stress corrosion
- Fouling product buildup due to biological and particulate
- Loss of bolting function due to general corrosion.
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the HVAC System components.

- Bolting Integrity Program (**B.2.1.16**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.10 Control Air System (032)

Materials

The materials of construction for the Control Air System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloys
- Aluminum alloy
- Copper alloy
- Nickel alloy
- Stainless steel

Environment

The Control Air System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated Water

Aging Effects Requiring Management

The following aging effects associated with the Control Air System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Control Air System components.

- Bolting Integrity Program (**B.2.1.16**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- Compressed Air Monitoring Program (**B.2.1.21**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.11 Service Air System (033)

Materials

The materials of construction for the Service Air System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Stainless steel

Environment

The Service Air System components are exposed to the following environments:

- Air/gas
- Inside air

Aging Effects Requiring Management

The following aging effects associated with the Service Air System require management:

- Loss of bolting function due to general corrosion.
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Service Air System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.12 CO_2 System (039)

Materials

The materials of construction for the CO2 System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomers
- Glass
- Nickel alloy
- Stainless steel

Environment

The CO2 System components are exposed to the following environments:

- Air/gas
- Inside air

Aging Effects Requiring Management

The following aging effects associated with the CO2 System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the CO2 System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.13 Station Drainage System (040)

Materials

The materials of construction for the Station Drainage System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The Station Drainage System components are exposed to the following environments:

- Air/gas
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Station Drainage System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Station Drainage System components:

- Bolting Integrity Program (**B.1.2.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.14 Sampling and Water Quality System (043)

Materials

The materials of construction for the Sampling and Water Quality System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Glass
- Nickel alloy
- Polymer
- Stainless steel

Environment

The Sampling and Water Quality System components are exposed to the following environments:

- Air/gas
- Inside air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Sampling and Water Quality System require management:

- Crack initiation and growth due to SCC, fatigue, and cyclic loading
- Loss of bolting function due to general corrosion and wear
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Sampling and Water Quality System components.

- ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.15 Building Heat System (044)

Materials

The materials of construction for the Building Heat System components are:

- Carbon and low alloy steel
- Copper alloy

Environment

The Building Heat System components are exposed to the following environments:

- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Building Heat System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general, crevice, pitting and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Building Heat System components.

- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.16 Raw Water Chemical Treatment System (050)

Materials

The materials of construction for the Raw Water Chemical Treatment System components are:

- Carbon and low alloy steel
- Nickel alloy
- Polymer
- Stainless steel

Environment

The Raw Water Chemical Treatment System components are exposed to the following environments:

- Outside air
- Raw water[1]

Aging Effects Requiring Management

The following aging effects associated with the Raw Water Chemical Treatment System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, crevice, and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Raw Water Chemical Treatment System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

1 The portion of System 50 requiring an AMR provides pressure boundary integrity for the System 23 (RHRSW) and System 67 (EECW). The in-scope portion of System 50 is from the RHRSW and EECW main headers to the second System 50 isolation valve.

3.3.2.1.17 Demineralizer Backwash Air System (053)

Materials

The materials of construction for the Demineralizer Backwash Air System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy - gray
- Copper alloy

Environment

The Demineralizer Backwash Air System components are exposed to the following environments:

- Air/gas – pooled moisture
- Inside air

Aging Effects Requiring Management

The following aging effects associated with the Demineralizer Backwash Air System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general, crevice, and pitting corrosion
- Loss of material due to selective leaching

Aging Management Programs

The following aging management programs manage the aging effects for the Demineralizer Backwash Air System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.18 Standby Liquid Control System (063)

Materials

The materials of construction for the Standby Liquid Control (SLC) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Polymer (Delrin)
- Stainless steel

Environment

The SLC System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water
- Treated water (Borated)

Aging Effects Requiring Management

The following aging effects associated with the SLC System require management:

- Loss of bolting function due to wear and general corrosion
- Loss of material due to general, crevice, and pitting corrosion
- Crack initiation and growth due to stress corrosion, fatigue, and cyclic loading

Aging Management Programs

The following aging management programs manage the aging effects for the SLC System components.

- ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.19 Off-Gas System (066)

Materials

The materials of construction for the Off-Gas System components are:

- Carbon and low alloy steel
- Copper alloy
- Stainless steel

Environment

The Off-Gas System components are exposed to the following environments:

- Air/gas
- Inside air

Aging Effects Requiring Management

The following aging effects associated with the Off-Gas System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Off-Gas System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.20 Emergency Equipment Cooling Water System (067)

Materials

The materials of construction for the Emergency Equipment Cooling Water System (EECW) components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The EECW System components are exposed to the following environments:

- Air/gas
- Buried
- Embedded/encased
- Inside air
- Outside air
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the EECW System require management:

- Fouling due to biological and particulate buildup
- Loss of bolting function due to MIC, general, crevice, and pitting corrosion
- Loss of material due to biofouling, MIC, general, crevice, pitting and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the EECW System components.

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.21 Reactor Water Cleanup System (069)

Materials

The materials of construction for the Reactor Water Cleanup (RWCU) System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Glass
- Stainless steel

Environment

The RWCU System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the RWCU System require management:

- Change in material properties and reduction in fracture toughness due to thermal aging
- Crack initiation and growth due to stress corrosion, fatigue, and cyclic loading
- Loss of bolting function due to general corrosion and wear
- Loss of material due to general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the RWCU System components.

- ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Reactor Water Cleanup System Program (**B.2.1.22**)
- BWR Stress Corrosion Cracking (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.22 Reactor Building Closed Cooling Water System (070)

Materials

The materials of construction for the Reactor Building Closed Cooling Water (RBCCW) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Glass
- Stainless steel

Environment

The RBCCW System components are exposed to the following environments:

- Air and gas
- Inside air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the RBCCW System require management:

- Loss of bolting function due to general corrosion.
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the RBCCW System components.

- Bolting Integrity Program (**B.2.1.16**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.23 Reactor Core Isolation Cooling System (071)

Materials

The materials of construction for the Reactor Core Isolation Cooling (RCIC) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy - gray
- Copper alloy
- Glass
- Stainless steel

Environment

The RCIC System components are exposed to the following environments:

- Air/gas
- Inside air
- Lubricating oil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the RCIC System require management:

- Crack initiation and growth due to cyclic loading, stress corrosion, and fatigue
- Fouling product buildup due to particulates
- Loss of bolting function due to wear and general corrosion
- Loss of material due to flow accelerated, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the RCIC System components.

- ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.24 Auxiliary Decay Heat Removal System (072) (F.11)

Materials

The materials of construction for the Auxiliary Decay Heat Removal (ADHR) System components are:

- Carbon and low alloy steel
- Stainless steel

Environment

The ADHR System components are exposed to the following environments:

- Air and gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the ADHR System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to crevice and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the ADHR System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)

3.3.2.1.25 Radioactive Waste Treatment System (077)

Materials

The materials of construction for the Radioactive Waste Treatment System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Elastomers (Neoprene and silicone)
- Copper alloy
- Stainless steel

Environment

The Radioactive Waste Treatment System components are exposed to the following environments:

- Air/gas
- Embedded/encased
- Inside air
- Lubricating oil
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Radioactive Waste Treatment System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Radioactive Waste Treatment System components.

- Bolting Integrity Program (**B.2.1.16**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.26 Fuel Pool Cooling and Cleanup System (078)

Materials

The materials of construction for the Fuel Pool Cooling and Cleanup System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Stainless steel

Environment

The Fuel Pool Cooling and Cleanup System components are exposed to the following environments:

- AFFF
- Air/gas
- Embedded/encased
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Fuel Pool Cooling and Cleanup System require management:

- Crack initiation and growth due to stress corrosion
- Loss of bolting function due to general, crevice, and pitting corrosion
- Loss of material due to general, crevice, pitting and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Fuel Pool Cooling and Cleanup System components.

- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.27 Fuel Handling and Storage System (079)

Materials

The materials of construction for the Fuel Handling and Storage System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Stainless steel

Environment

The Fuel Handling and Storage System components are exposed to the following environments:

- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Fuel Handling and Storage System, require management:

- Crack initiation and growth due to stress corrosion
- Loss of bolting function due to stress relaxation
- Loss of material due to crevice, pitting, general, and galvanic corrosion
- Loss of material due to mechanical wear

Aging Management Programs

The following aging management programs manage the aging effects for the Fuel Handling and Storage System components.

- Chemistry Control Program (**B.2.1.5**)
- Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)

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3.3.2.1.28 Diesel Generator System (082)

Materials

The materials of construction for the Diesel Generator (DG) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomers
- Glass
- Stainless steel

Environment

The DG System components are exposed to the following environments:

- Air/gas
- Inside air
- Lubricating oil
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the DG System require management:

- Crack initiation and growth due to stress corrosion
- Elastomer degradation/deterioration due to thermal exposure and ultraviolet radiation
- Loss of bolting function due to general corrosion.
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the DG System components:

- Bolting Integrity Program (**B.2.1.16**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- System Monitoring Program (**B.2.1.39**)

3.3.2.1.29 Control Rod Drive System (085)

Materials

The materials of construction for the Control Rod Drive (CRD) System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The CRD System components are exposed to the following environments:

- Air/gas
- Inside air
- Lubricating oil
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the CRD System require management:

- Crack initiation and growth due to stress corrosion
- Loss of bolting function due to general corrosion and wear
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the CRD System components.

- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.30 Diesel Generator Starting Air System (086)

Materials

The materials of construction for the DG Starting Air System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Elastomers
- Glass
- Stainless steel

Environment

The DG Starting Air System components are exposed to the following environments:

- Air/gas
- Inside air
- Lubricating oil

Aging Effects Requiring Management

The following aging effects associated with the DG Starting Air System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the DG Starting Air System components:

- Bolting Integrity Program (**B.2.1.16**)
- Diesel Starting Air Program (**B.2.1.41**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.31 Radiation Monitoring System (090)

Materials

The materials of construction for the Radiation Monitoring System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Copper alloy
- Glass
- Polymer (Tygon)
- Stainless steel

Environment

The Radiation Monitoring System components are exposed to the following environments:

- Air/gas
- Inside air
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Radiation Monitoring System require management:

- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching

Aging Management Programs

The following aging management programs manage the aging effects for the Radiation Monitoring System components:

- Bolting Integrity Program (**B.2.1.16**)
- Closed-Cycle Cooling Water System Program (**B.2.1.18**)
- One-Time Inspection Program (**B.2.1.29**)
- Open-Cycle Cooling Water System Program (**B.2.1.17**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.3.2.1.32 Neutron Monitoring System (092)

Materials

The materials of construction for the Neutron Monitoring System components are:

- Carbon and low alloy steel
- Stainless steel

Environment

The Neutron Monitoring System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Neutron Monitoring System require management:

- Crack initiation and growth due to stress corrosion and cyclic loading
- Loss of bolting function due to general corrosion and wear
- Loss of material due to crevice and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Neutron Monitoring System components:

- ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)

3.3.2.1.33 Traversing In-Core Probe System (094)

Materials

The materials of construction for the Traversing In-core Probe (TIP) System components are:

- Stainless steel

Environment

The TIP System components are exposed to the following environments:

- Air/gas
- Inside air

Aging Effects Requiring Management

The following aging effects associated with the TIP require management:

- None

Aging Management Programs

The following aging management programs manage the aging effects for the TIP System components:

- None

3.3.2.1.34 Cranes System (111)

Materials

The materials of construction for the Cranes System components are:

- Carbon and low alloy steel
- Stainless steel

Environment

The Cranes System components are exposed to the following environments:

- Inside air

Aging Effects Requiring Management

The following aging effects associated with the Cranes System require management:

- Crack initiation and growth due to fatigue
- Loss of bolting function due to stress relaxation
- Loss of material due to general corrosion
- Loss of material due to mechanical wear

Aging Management Programs

The following aging management programs manage the aging effects for the Cranes System components:

- Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B. 2.1.20**)

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 by the reviewer in the license renewal application. For the Auxiliary Systems, those programs are addressed in the following sections.

3.3.2.2.1 Loss of Material due to General, Pitting, and Crevice Corrosion

NUREG-1800 paragraph 3.3.2.2.1 recommendation for Further Evaluation is:

1. This evaluation only applies to the spent fuel pool cooling and cleanup system. BFN will implement a One-Time Inspection Program (Section **B.2.1.29**) to verify the effectiveness of the Chemistry Control Program (Section **B.2.1.5**) at managing the loss of material due to general corrosion at locations of stagnant flow conditions in the spent fuel pool cooling and cleanup system.
2. This evaluation only applies to the spent fuel pool cooling and cleanup system. BFN will implement a One-Time Inspection Program (Section B.2.1.29) to verify the effectiveness of the Chemistry Control Program (Section B.2.1.5) at managing the loss of material due to pitting and crevice corrosion at locations of stagnant flow conditions in the spent fuel pool cooling and cleanup system.

3.3.2.2.2 Hardening and Cracking or Loss of Strength due to Elastomer Degradation or Loss of Material due to Wear

Elastomers are not used in components subject to an AMR in the spent fuel cooling and cleanup system. See AMR results on Table **3.3.2.26**.

Hardening and loss of strength due to elastomer degradation in ventilation systems is dependent on environmental conditions. This aging effect is managed by the Systems Monitoring Program (Section **B.2.1.39**) if the environmental threshold is exceeded. See Tables **3.3.2.8** and **3.3.2.9** for the summary of AMR evaluation results for the ventilation systems.

Loss of material due to wear of elastomer components is managed by the by the Systems Monitoring Program (Section B.2.1.39) if the environmental threshold is exceeded. See Tables 3.3.2.8 and 3.3.2.9 for the summary of AMR evaluation results for the ventilation systems.

3.3.2.2.3 Cumulative Fatigue Damage

Per NUREG-1800 paragraph 3.3.2.2.3, 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 evaluations of these TLAAs are addressed separately in Sections **4.3.3** and **4.7.1**.

3.3.2.2.4 Crack Initiation and Growth due to Cracking or Stress Corrosion Cracking

This Further Evaluation only applies to regenerative and non-regenerative heat exchanger components in the BFN Reactor Water Cleanup System. See Table **3.3.2.21** for the summary of AMR evaluation results for the Reactor Water Cleanup System. SCC is managed by the Chemistry Control Program (Section **B.2.1.5**) and the One-Time Inspection Program (Section **B.2.1.29**).

3.3.2.2.5 Loss of Material due to General, Microbiologically Influenced, Pitting, and Crevice Corrosion

The discussion of this paragraph in NUREG-1800 includes the loss of material from corrosion that could occur on the internal and external surfaces of components exposed to air and the associated range of atmospheric conditions. Specifically included in this paragraph are the ventilation, diesel fuel oil, starting air, and combustion air systems and the external carbon steel surfaces of all auxiliary systems. The One-Time Inspection Program (Section **B.2.1.29**), Fire Water System Program (Section **B.2.1.24**), Diesel Starting Air Program (Section **B.2.1.41**), System Monitoring Program (Section **B.2.1.39**), and Bolting Integrity Program (Section **B.2.1.16**) will manage loss of material.

3.3.2.2.6 Loss of Material due to General, Galvanic, Pitting, and Crevice Corrosion

The discussion in this paragraph of NUREG-1800 is not applicable to BFN since the BFN design does not include a recirculation pump oil collection system.

3.3.2.2.7 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion and Biofouling

BFN will perform a one-time inspection in accordance with the One-Time Inspection Program (Section **B.2.1.29**) to verify the effectiveness of the Fuel Oil Chemistry Program (Section **B.2.1.27**). The inspection will ensure that corrosion is not occurring at locations where contaminants accumulate.

3.3.2.2.8 Quality Assurance for Aging Management of Nonsafety-Related Components

See Section **B.1.3** of this application for further discussion.

3.3.2.2.9 Cracking Initiation and Growth due to Stress Corrosion Cracking and Cyclic Loading

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.3.2.2.10 Reduction of Neutron-Absorbing Capacity and Loss of Material due to General Corrosion

Boral is used as a neutron absorbing material in the spent fuel pools at BFN. Reduction of neutron absorbing capacity and loss of material due to general corrosion could occur at BFN in the boral neutron absorbing material in spent fuel storage racks. The Chemistry Control Program manages general corrosion. A one-time inspection of boral coupon test specimens was performed at BFN that confirmed no significant aging degradation had occurred and the neutron absorbing capability of the boral had not been reduced. Reduction of neutron absorbing capacity and loss of material due to general corrosion will be managed by the Chemistry Control Program (**B.2.1.5**).

3.3.2.2.11 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

Loss of material for underground piping is managed by the Buried Piping and Tanks Inspection Program (**B.2.1.31**). The Buried Piping and Tanks Inspection Program utilizes an inspection of excavated piping to evaluate effectiveness of the program.

3.3.2.3 Time-Limited Aging Analysis

TLAAs identified for Auxiliary Systems include:

- Piping and Component Fatigue Analysis (Section **4.3.3**)
- Reactor Building Crane Load Cycles (Section **4.7.1**)
- Corrosion – Flow Reduction (Section **4.7.2**)
- Dose to Seal Rings to HPCI and RCIC Containment Isolation Check Valves (Section **4.7.3**)
- EECW Weld Flaw Evaluation (Section **4.7.8**)

3.3.3 Conclusion

The Auxiliary Systems piping, fittings, and 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 Systems 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 demonstrations 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.

Table 3.3.1 Summary of Aging Management Evaluations for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.1	Components in spent fuel pool cooling and cleanup	Loss of material due to general, pitting, and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects should is to be further evaluated	Consistent with NUREG-1801 with exceptions. See further evaluation in Section **3.3.2.2.1**. See description of AMP in Section **B.2.1.5.** and **B.2.1.29**
3.3.1.2	Linings in spent fuel pool cooling and cleanup system; seals and collars in ventilation systems	Hardening, cracking and loss of strength due to elastomer degradation; loss of material due to wear.	Plant specific	Yes, plant specific	See further evaluation in Section **3.3.2.2.2**.
3.3.1.3	Components in load handling, chemical and volume control system (PWR), and reactor water cleanup and shutdown cooling systems (older BWR)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR54.21 (c)	Yes, TLAA	Consistent with NUREG-1801. See further evaluation in Section **3.3.2.2.3**. See discussion of TLAA for fatigue of load handling components in Section **4.7.1** See discussion of TLAA for fatigue of Reactor Water cleanup system components in Section **4.3**. BFN does not have a chemical and volume control system (PWR) or a shutdown cooling systems
3.3.1.4	Heat exchangers in reactor water cleanup system (BWR); high pressure pumps in chemical and volume control system (PWR)	Crack initiation and growth due to SCC or cracking	Plant specific	Yes, plant specific	See further evaluation in Section **3.3.2.2.4**.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.1 Summary of Aging Management Evaluations for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.5	Components in ventilation systems, diesel fuel oil system, and emergency diesel generator systems; external surfaces of carbon steel components	Loss of material due to general, pitting, and crevice corrosion, and MIC	Plant specific	Yes, plant specific	See further evaluation in Section **3.3.2.2.5**.
3.3.1.6	Components in reactor coolant pump oil collect system of fire protection	Loss of material due to galvanic, general, pitting, and crevice corrosion	One-time inspection	Yes, detection of aging effects is to be further evaluated	Not applicable to BFN. BFN does not have an oil collection system for its reactor recirculation pumps.
3.3.1.7	Diesel fuel oil tanks in diesel fuel oil system and emergency diesel generator system	Loss of material due to general, pitting, and crevice corrosion, MIC, and biofouling	Fuel oil chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801 with exceptions to the fuel oil chemistry program. See further evaluation in Section **3.3.2.2.7**. See description of AMPs in Sections **B.2.1.27** and **B.2.1.29**.
3.3.1.8	Piping, pump casing, and valve body and bonnets in shutdown cooling system (older BWR)	Loss of material due to pitting and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Not applicable to BFN. BFN is not an older BWR with a Shutdown Cooling System. The shutdown cooling function is performed by the Residual Heat Removal system.
3.3.1.9	PWR only.				
3.3.1.10	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity and loss of material due to general corrosion (Boral, boron steel)	Plant specific	Yes, pant specific	See further evaluation in Section **3.3.2.2.10**.
3.3.1.11	New fuel rack assembly	Loss of material due to general, pitting, and crevice corrosion	Structures monitoring	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.36**.
3.3.1.12	Neutron absorbing sheets in spent fuel storage racks	Reduction of neutron absorbing capacity due to Boraflex degradation	Boraflex monitoring	No	Not applicable to BFN. BFN uses Boral as the spent fuel storage rack neutron absorber.

Table 3.3.1 Summary of Aging Management Evaluations for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801

Item Number	Component	Aging Effect/Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1.13	Spent fuel storage racks and valves in spent fuel pool cooling and cleanup	Crack initiation and growth due to stress corrosion cracking	Water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.5**.
3.3.1.14	PWR only.				
3.3.1.15	Components in or serviced by closed-cycle cooling water system	Loss of material due to general, pitting, and crevice corrosion, and MIC	Closed-cycle cooling water system	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.18**.
3.3.1.16	Cranes including bridge and trolleys and rail system in load handling system	Loss of material due to general corrosion and wear	Overhead heavy load and light load handling systems	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.20**.
3.3.1.17	Components in or serviced by open-cycle cooling water systems	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.17**.
3.3.1.18	Buried piping and fittings	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	BFN has chosen to implement the Buried Piping and Tanks Inspection Program (Section **B.2.1.31**) without exceptions See discussion of further evaluation in **3.3.2.2.11**.
3.3.1.19	Components in compressed air system	Loss of material due to general and pitting corrosion	Compressed air monitoring	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.21**.
3.3.1.20	Components (doors and barrier penetration seals) and concrete structures in fire protection	Loss of material due to wear; hardening and shrinkage due to weathering	Fire protection	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.23**.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.1 Summary of Aging Management Evaluations 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	Components in water-based fire protection	Loss of material due to general, pitting, crevice, and galvanic corrosion, MIC, and biofouling	Fire water system	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.24**.
3.3.1.22	Components in diesel fire system	Loss of material due to galvanic, general, pitting, and crevice corrosion,	Fire protection and fuel oil chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.23** and **B.2.1.27**.
3.3.1.23	Tanks in diesel fuel oil system	Loss of material due to general, pitting, and crevice corrosion	Above ground carbon steel tanks	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.26**.
3.3.1.24	Closure bolting	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and SCC	Bolting integrity	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.16**.
3.3.1.25	Components in contact with sodium pentaborate solution in standby liquid control system (BWR)	Crack initiation and growth due to SCC	Water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.5**.
3.3.1.26	Components in reactor water cleanup system	Crack initiation and growth due to SCC and IGSCC	Reactor water cleanup system inspection	No	The NUREG-1801 XI.M25 Reactor Water Cleanup system AMP provides criteria for which inspections are not recommended. Since BFN meets these criteria, Inspections will not be conducted. See description of AMP in Section **B.2.1.22**.
3.3.1.27	Components in shutdown cooling system (older BWR)	Crack initiation and growth due to SCC	BWR stress corrosion cracking and water chemistry	No	Not applicable to BFN. BFN is not an older BWR with a Shutdown Cooling System. The shutdown cooling function is performed by the Residual Heat Removal system.
3.3.1.28	Components in shutdown cooling system (older BWR)	Loss of material due to pitting and crevice corrosion, and MIC	Closed-cycle cooling water system	No	Not applicable to BFN. BFN is not an older BWR with a Shutdown Cooling System. The shutdown cooling function is performed by the Residual heat Removal system.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.1 Summary of Aging Management Evaluations 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	Components (aluminum, bronze, brass, cast iron, cast steel) in open-cycle and closed-cycle cooling water systems, and ultimate heat sink	Loss of material due to selective leaching	Selective leaching of materials	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.30**.
3.3.1.30	Fire barriers, walls, ceilings, and floors in fire protection	Concrete cracking and spalling due to freeze-thaw, aggressive chemical attack, and reaction with aggregates; loss of material due to corrosion of embedded steel	Fire protection and structures monitoring	No	Consistent with NUREG-1801 with exceptions. See description of AMPs in Sections **B.2.1.23,** Fire protection **B.2.1.36**, Structures monitoring

Table 3.3.2.1: Auxiliary Boiler System (012) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	H, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, galvanic, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39) One-Time Inspection Program (B.2.1.29)	V.E.1-b	3.2.1.10	A, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	E
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	H, 4
Fittings	PB	Stainless Steel	Air/gas (internal) - moist air	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	H, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, galvanic, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	G, 2

Table 3.3.2.1: Auxiliary Boiler System (012) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	**3.2.1.10**	A, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	E
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 4
Piping	PB	Stainless Steel	Air/gas (internal) - moist air	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Traps	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 2
Traps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tubing	PB	Stainless Steel	Air/gas (internal) - moist air	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 2
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	H, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.1: Auxiliary Boiler System (012) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	E
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) - moist air	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.3-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) - moist air	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 2
Valves	PB	Copper Alloy	Air/gas (internal) - moist air	Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note E Consistent with NUREG-1801 item for material, environment, and aging effect, a different aging management program is credited.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 The One-Time Inspection Program (**B.2.1.29**) will be used to verify the integrity of abandoned-in-place piping.

4 The additional aging effects identified for this material/environment combination are consistent with industry guidance..

5 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Fittings	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.G.8-a	None	G, 2
Fittings	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H1.4-a	None	G, 2
Fittings	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.5-a	None	G, 2
Fittings	DP, PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 3
Fittings	DP, PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 4
Fittings	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	H, 3
Fittings	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5
Fittings	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	**3.3.1.7**	B
Fittings	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	**3.3.1.7**	B
Fittings	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	DP, PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	None	None	VII.G.8-a	None	F, 2
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	None	None	VII.H1.4-a	None	F, 2
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	None	None	VII.H2.5-a	None	F, 2
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	F, 3
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	F, 3
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Embedded/ Encased (external)	None	None	VII.I.1-b	None	F, 4
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Fittings	DP, PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Fittings	DP, PB	Aluminum Alloy and Copper Alloy	Air/gas (internal)	None	None	VII.G.8-a	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	DP, PB	Copper Alloy	Air/gas (internal)	None	None	VII.H1.4-a	None	F, 4
Fittings	DP, PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.5-a	None	F, 4
Fittings	DP, PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Fittings	DP, PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Fittings	DP, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	DP, PB	Aluminum Alloy and Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	DP, PB	Stainless Steel	Air/gas (internal)	None	None	VII.G.8-a	None	F, 4
Fittings	DP, PB	Stainless Steel	Air/gas (internal)	None	None	VII.H2.5-a	None	F, 4
Fittings	DP, PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Fittings	DP, PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Fittings	DP, PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Fittings	DP, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	DP, PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 4
Flex Hose	PB	Elastomer - Rubber	Fuel Oil (internal)	Elastomer degradation due to oxidation	One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 4
Flex Hose	PB	Elastomer - Rubber	Fuel Oil (internal)	Elastomer degradation due to oxidation	One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 4
Flex Hose	PB	Elastomer - Rubber	Inside Air (external)	Elastomer degradation due to ultraviolet radiation.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Flex Hose	PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Flex Hose	PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Flex Hose	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.G.8-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H1.4-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.5-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	**3.3.1.7**	B
Piping	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	**3.3.1.7**	B
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Pumps	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	H, 3
Pumps	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5
Pumps	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	**3.3.1.7**	B

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	**3.3.1.7**	B
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Pumps	PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	H, 3
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	**3.3.1.7**	B
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	FR, PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Restricting Orifice	FR, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Strainers	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	H, 3
Strainers	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5
Strainers	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27)** One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	**3.3.1.7**	B
Strainers	DP, PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	**3.3.1.7**	B
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 3
Strainers	DP, PB	Nickel Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H1.4-a	None	F, 3
Strainers	DP, PB	Aluminum Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H1.4-a	None	F, 3
Strainers	DP, PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Strainers	DP, PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H2.5-a	None	F, 3
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.G.8-a	None	G, 2
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H1.4-a	None	G, 2
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.5-a	None	G, 2
Tanks	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 4
Tanks	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.G.8-a	None	H, 5
Tanks	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to crevice, general, and pitting corrosion.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.G.8-a	None	E

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 6
Tanks	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H1.4-a	3.3.1.7	B
Tanks	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.H1.4-a	None	I, 7
Tanks	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H2.5-a	3.3.1.7	B
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tubing	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5
Tubing	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.G.8-a	None	H, 3
Tubing	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H2.5-a	3.3.1.7	B
Tubing	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tubing	PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.G.8-a	None	F, 3
Tubing	PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (B.2.1.27) One-Time Inspection Program (B.2.1.29)	VII.H2.5-a	None	F, 3

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Tubing	PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H1.4-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.5-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	None	None	VII.G.8-a	None	I, 5
Valves	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	**3.3.1.7**	B
Valves	PB	Carbon and Low Alloy Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	**3.3.1.7**	B
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	None	None	VII.H1.4-a	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	None	None	VII.H2.5-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.2: Fuel Oil System (018) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Valves	PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.G.8-a	None	F, 3
Valves	PB	Copper Alloy	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H1.4-a	None	F, 3
Valves	PB	Stainless Steel	Fuel Oil (internal)	Loss of material due to MIC.	Fuel Oil Chemistry Program (**B.2.1.27**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.5-a	None	F, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note E Consistent with NUREG-1801 item for material, environment, and aging effect, a different aging management program is credited.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking is not considered a license renewal concern due to high cycle fatigue since it would be discovered during the current license period and corrected. Therefore, SCC and cyclic load are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. By means of evaporation and condensation processes, fuel oil coats the internal surfaces of components that have an internal air/gas environment, thereby preventing moisture accumulation and thus general, crevice, pitting and galvanic corrosion are not aging management concerns.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

5 General, crevice, pitting and galvanic corrosion are not aging management concerns since water collection does not occur in these components.

6 Fuel oil, even if contaminated, is not a good conducting electrolyte. Under stagnant conditions, water and any other contaminants may settle and a conducting electrolyte can exist. However, there are no galvanic couples in those portions of the fuel oil storage tanks where water may collect.

7 Biofouling is not an aging effect concern for this material/environment combination.

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to pitting corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	None	H, 6
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Raw Water (external)	Loss of bolting function due to MIC, crevice, general, and pitting corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	None	G, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 3
Bolting	MC, SS	Stainless Steel	Outside Air (external)	None	None	VII.I.2-a	None	F, 3
Bolting	MC, SS	Stainless Steel	Raw Water (external)	Loss of bolting function due to MIC, crevice and pitting corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice corrosion, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (B.2.1.31)	VII.C1.1-b	3.3.1.18	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to pitting corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	H, 6
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII I.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII C1.1-a	**3.3.1.17**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.1-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	None	F, 2
Fittings	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 2
Fittings	PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Polymer	Treated Water (internal)	None	None	VII.C1.1-a	None	F, 3
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.C1.1-a	None	G, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII I.1-b	None	F, 2
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Fittings	PB	Stainless Steel	Raw Water (internal)	None	None	VII.C1.1-a	None	I, 7
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to crevice, general, and pitting corrosion and MIC.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.C1.1-b	**3.3.1.18**	A
Piping	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to pitting corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	H, 6
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 2
Piping	PB	Cast Iron and Cast Iron Alloy	Embedded/ Encased	None	None	VII.I.1-b	None	G, 3
Piping	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	F, 2
Piping	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.1-a	None	F, 2
Piping	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	F, 2
Piping	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	None	F, 2
Piping	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 2
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	VII.C1.1-a	None	G, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	F, 2
Piping	PB	Stainless Steel	Raw Water (internal)	None	None	VII.C1.1-a	None	I, 7
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII C1.1-a	**3.3.1.17**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Pumps	PB	Carbon and Low Alloy Steel	Raw Water (external)	Loss of material due to biofouling, MIC, galvanic, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	G, 2
Pumps	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII C1.5-a	**3.3.1.17**	A
Pumps	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.5-a	None	H, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	F, 2
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.5-a	None	F, 2
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	F, 2
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.5-a	None	F, 2
Pumps	PB	Stainless Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	F, 2
Pumps	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.5-a	None	F, 2
Restricting Orifice	FR, PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.4-a	**3.3.1.17**	A
Strainers	DP	Carbon and Low Alloy Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	G, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	DP	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.6-a	3.3.1.17	A
Strainers	DP	Stainless Steel	Raw Water (external)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.I.1-b	None	F, 2
Strainers	DP	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.6-a	3.3.1.17	A
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.1-a	None	C, 2
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to pitting corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	H, 6
Valves	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (external)	Loss of material due to biofouling, MIC, galvanic, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.I.1-b	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	3.3.1.17	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	None	H, 4
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	G, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.2-a	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.I.1-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	None	F, 2
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	VII.C1.2-a	None	G, 3
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	**3.3.1.17**	A
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.2-a	**3.3.1.29**	A
Valves	PB	Aluminum Alloy and Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice corrosion and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.C1.2-a	None	G, 2
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	VII.C1.2-a	None	G, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.3: Residual Heat Removal Service Water System (023) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17) One-Time Inspection Program (B.2.1.29)	VII.C1.2-a	3.3.1.17	A, 5

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

5 The interface with the Raw Water Chemical Treatment System (Section **3.3.2.1.16**) sees raw water and a concentrated chemical mixture that includes biocides, liquid inhibitors formulated to control corrosion, and dispersants for suspended material such as silt and metal oxides. Valves at this interface will receive a one-time inspection to confirm the effectiveness of management using the Open-Cycle Cooling Water System Program (Section **B.2.1.17**).

6 Components in the RHRSW tunnel are exposed to inside air with no controls on temperature or humidity. Condensation on the RHRSW piping and associated components has resulted in pitting corrosion at BFN.

7 In galvanic couples, stainless steel materials have higher potential (more cathodic) when attached to (anodic) metals such as carbon steel or non-ferrous materials and will not corrode.

Table 3.3.2.4: Raw Cooling Water System (024) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 2
Expansion Joint	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Expansion Joint	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 3
Expansion Joint	PB	Elastomer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Expansion Joint	PB	Elastomer	Raw Water (internal)	None	None	None	None	J, 2
Fittings	FR, PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	G, 3, 4
Fittings	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A, 4
Fittings	FR, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, galvanic, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.1-a	3.3.1.17	A, 4
Fittings	FR, PB	Cast Iron and Cast Iron Alloy	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	F, 3, 4
Fittings	FR, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 3, 4
Fittings	FR, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, general, galvanic, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.1-a	None	F, 4, 6
Fittings	FR, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4, 2
Fittings	FR, PB	Copper Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, galvanic, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.1-a	3.3.1.17	A, 4

Table 3.3.2.4: Raw Cooling Water System (024) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	FR, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.1-a	**3.3.1.29**	A, 4
Fittings	FR, PB	Polymer	Air/Gas (internal)	None	None	VII.C1.1-a	None	F, 2, 4
Fittings	FR, PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2, 4
Fittings	FR, PB	Stainless Steel	Air/Gas (internal)	None	None	VII.C1.1-a	None	G, 2, 4
Fittings	FR, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4, 2
Fittings	FR, PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A, 4
Fittings	FR, PB	Stainless Steel	Raw Water (internal)	None	None	VII.C1.1-a	None	I, 4, 9
Fittings	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	F, 4, 7
Flex Hose	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Flex Hose	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C, 3
Piping	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, pitting and galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Piping	PB	Polymer	Air/Gas (internal)	None	None	VII.C1.1-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.4: Raw Cooling Water System (024) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Piping	PB	Stainless Steel	Air/Gas (internal)	None	None	VII.C1.1-a	None	G, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Piping	PB	Stainless Steel	Raw Water (internal)	None	None	VII.C1.1-a	None	I, 9
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.5-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.5-a	None	F, 3
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	None	H, 3
Strainers	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	**3.3.1.17**	A
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Strainers	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	**3.3.1.17**	A, 3
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.4: Raw Cooling Water System (024) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, galvanic, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C, 3, 8
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	**3.3.1.17**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	None	H, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.2-a	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, pitting and galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.2-a	None	F, 3
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.2-a	**3.3.1.29**	A
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	**3.3.1.17**	A

Table 3.3.2.4: Raw Cooling Water System (024) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	None	H, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	3.3.1.17	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 This item includes flow restrictors as well as fittings, thermowells, and flow elements. The intended function, FR - flow restriction, is only applicable to the flow restrictors.

5 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

6 The fittings material is ASTM A197 (white cast iron). Selective leaching is not identified as an aging mechanism since it applies only to gray cast iron.

7 Thermocouples that control Raw Cooling Water System valves are located in stainless steel thermowells in the treated water environment at the shell side of the heat exchanger in the Reactor Building Closed Cooling Water System. The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

8 The materials are ASTM B75 & B88 that contain more than 99% copper. Selective leaching is not identified as the aging mechanisms as the materials do not contain over 15% zinc.

9 In galvanic couples, stainless steel materials have higher potential (more cathodic) when attached to (anodic) metals such as carbon steel or non-ferrous materials and will not corrode.

Table 3.3.2.5: Raw Service Water System (025) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	H, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to selective leaching	Selective Leaching of Materials Program (**B.2.1.30**)	V.E.1-b	None	G, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to MIC, general, crevice, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	V.E.1-b	None	G, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.5: Raw Service Water System (025) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, general, galvanic, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	F, 2
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	F, 2
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	H, 2
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Tanks	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tanks	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	C, 2

Table 3.3.2.5: Raw Service Water System (025) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Buried (external)	Loss of material due to MIC, crevice and pitting.	Buried Piping and Tanks Inspection Program (B.2.1.31)	V.E.1-b	None	G, 2
Tubing	PB	Copper Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	V.E.1-b	None	G, 2
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 2
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, galvanic, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	None	None	J, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, general, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.C.1-a	3.2.1.3, 3.2.1.5, 3.2.1.6	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion:	Open-Cycle Cooling Water System Program (B.2.1.17)	V.C.1-a	None	H, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	V.C.1-a	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, general, galvanic, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Copper Alloy	Outside Air (external)	None	None	V.E.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.5: Raw Service Water System (025) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, galvanic, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	F, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 There are no aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Buried (external)	Loss of bolting function due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**) Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	None	G, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	VII.I.2-b	None	I, 2
Bolting	MC, SS	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of bolting function due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**) Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	None	F, 1
Bolting	MC, SS	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of bolting function due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**) Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	None	F, 1
Fan(Housings)	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 3
Fan(Housings)	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fire Hose Stations	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fire Hydrants	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (B.2.1.31)	VII.I.1-b	None	G, 1
Fire Hydrants	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.I.1-b	None	G, 1
Fire Hydrants	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 1
Fire Hydrants	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	None	None	VII.G.6-b	None	I, 4
Fire Hydrants	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.G.6-b	None	H, 2
Fire Hydrants	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Fire Water System Program (B.2.1.24)	VII.G.6-b	3.3.1.21	B
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (B.2.1.24)	VII.G.6-a	None	G, 1
Fittings	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (B.2.1.31)	VII.I.1-b	None	G, 1
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general corrosion, and pitting corrosion.	Fire Water System Program (B.2.1.24)	VII.G.6-a	3.3.1.21	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	None	G, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	G, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-a	None	H, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	B
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-a	None	G, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.G.6-a	None	G, 1
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.G.6-a	None	F, 3
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-a	None	F, 1
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	None	F, 1
Fittings	PB	Glass	Air/gas (internal) AFFF (internal)	None	None	VII.G.6-a	None	F, 3
Fittings	PB	Glass	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	AFFF (internal)	None	None	VII.G.6-a	None	G, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	B
Flexible Connectors	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Flexible Connectors	PB	Elastomer (Rubber, reinforced fabric)	Inside Air (external)	Elastomer degradation due to ultraviolet radiation.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Flexible Connectors	PB	Elastomer (Rubber, reinforced fabric)	Raw Water (internal) Air/gas (internal)	None	None	None	None	J, 3
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connectors	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	D, 1
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 1
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	D, 1
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	None	None	VII.G.6-b	None	I, 5
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-b	None	H, 1
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 1
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice corrosion, pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 1
Heaters	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Heaters	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 1
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	None	G, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	B
Piping	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	None	G, 1
Piping	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Piping	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	G, 1
Piping	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Piping	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-a	None	H, 1
Piping	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general corrosion, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	B

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice corrosion, galvanic corrosion, general corrosion, pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.G.6-a	None	G, 1
Piping	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-a	None	G, 1
Piping	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-a	None	F, 1
Piping	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	None	F, 1
Piping	PB	Stainless Steel	AFFF (internal)	None	None	VII.G.6-a	None	G, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	B
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	F, 1
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-b	None	H, 1
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.I.1-b	None	F, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Restricting Orifice	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 3
Restricting Orifice	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Restricting Orifice	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	None	None	J, 1
Restricting Orifice	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 1
Silencer	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 1
Silencer	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Sprinkler Heads	PB, SPR	Copper Alloy	Air/gas (internal)	None	None	VII.G.6-b	None	G, 3
Sprinkler Heads	PB, SPR	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Sprinkler Heads	PB, SPR	Copper Alloy	Raw Water (internal)	None	None	VII.G.6-b	None	I, 6
Sprinkler Heads	PB, SPR	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-b	None	H, 1
Sprinkler Heads	PB, SPR	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	DP, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	None	G, 1
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-b	None	H, 1
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Strainers	DP, PB	Nickel Based Alloys	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	None	F, 1
Strainers	DP, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Strainers	DP, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-b	None	H, 1
Strainers	DP, PB	Copper Alloy	Raw Water (internal)	None	None	VII.G.6-b	None	I, 7
Strainers	DP, PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Strainers	DP, PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 1
Tanks	PB	Elastomer Buna N	Treated Water (internal) AFFF (internal)	None	None	None	None	J, 3
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 1
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	None	None	J, 1
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-a	**3.3.1.21**	D, 1
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	None	G, 1
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.G.6-b	None	G, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	None	G, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	G, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Fire Water System Program (**B.2.1.24**)	VII.G.6-b	**3.3.1.21**	B
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.G.6-b	None	H, 1
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	VII.G.6-b	None	G, 3
Valves	PB	Copper Alloy	Buried (external)	Loss of material due to MIC, crevice, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Valves	PB	Copper Alloy	Buried (external)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.I.1-b	None	G, 1
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Table 3.3.2.6: High Pressure Fire Protection System (026) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.G.6-b	None	H, 1
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (B.2.1.24)	VII.G.6-b	3.3.1.21	B
Valves	PB	Copper Alloy	Raw Water (internal)	None	None	VII.G.6-b	None	I, 8
Valves	PB	Stainless Steel	AFFF (internal)	None	None	VII.G.6-b	None	G, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Fire Water System Program (B.2.1.24)	VII.G.6-b	3.3.1.21	B

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects identified for this material and environment combination are consistent with industry guidance.

2 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

3 There are no applicable aging effects for this material/environment. This is consistent with industry guidance.

4 Cast iron fire hydrants are not in contact with more cathodic dissimilar materials, therefore galvanic corrosion is not an aging effect/mechanism.

5 Copper alloy heat exchangers are not in contact with more cathodic dissimilar materials, therefore galvanic corrosion is not an aging effect/mechanism.

6 Sprinkler heads are not in contact with more cathodic dissimilar materials, therefore galvanic corrosion is not an aging effect/mechanism.

7 Copper and copper alloy strainers are not connected to more cathodic dissimilar materials, therefore galvanic corrosion is not an aging effect/mechanism.

8 Copper and copper alloy valves are not connected to more cathodic dissimilar materials, therefore galvanic corrosion is not an aging effect/mechanism.

Table 3.3.2.7: Potable Water System (029) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 2
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	I, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to general, crevice, pitting, and galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.7: Potable Water System (029) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	I, 3
Fittings	PB	Stainless Steel	Raw Water (internal)	Crack initiation and growth due to SCC	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	I, 2
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 2
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to crevice and pitting corrosion. Crack initiation/growth due to SCC	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	I, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Table 3.3.2.7: Potable Water System (029) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	I, 3
Valves	PB	Cast Iron and Cast Iron Alloy - gray	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy - gray	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy - gray	Raw Water (internal)	Loss of material due to general, crevice, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 5
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	I, 3
Valves	PB	Stainless Steel	Raw Water (internal)	Crack initiation/growth due to SCC	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The additional aging effects identified for this material/environment combination are consistent with other NUREG-1801 sections.

3 Water in the system is chlorinated, which prevents the growth of micro-organisms. Therefore, MIC and biofouling are not a concern.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

6 Chlorine is added to the system. Therefore, SCC is identified as an additional aging effect.

Table 3.3.2.8: Ventilation System (030) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	SS, MC	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	SS, MC	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	SS, MC	Aluminum Alloy	Outside Air (external)	None	None	VII.I.2-a	None	F, 2
Bolting	SS, MC	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 2
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.F2.1-a VII.F4.1-a	None	I, 3, 4
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	VII.F2.1-a VII.F4.1-a	**3.3.1.5**	A, 4
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A, 4
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A, 4
Ductwork	DP, PB, SS	Elastomer - Rubber and Silicone Rubber	Air/gas (internal)	None	None	VII.F2.1-a VII.F4.1-a	None	F, 4, 5
Ductwork	DP, PB, SS	Elastomer - Rubber and Silicone Rubber.	Inside Air (external)	Elastomer degradation due to ultraviolet radiation.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4, 5
Ductwork	DP, PB, SS	Aluminum Alloy	Air/gas (internal)	None	None	VII.F2.1-a VII.F4.1-a	None	F, 4, 5
Ductwork	DP, PB, SS	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.8: Ventilation System (030) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Ductwork	DP, PB, SS	Aluminum Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 4, 5
Ductwork	DP, PB, SS	Zinc Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4, 5
Ductwork	DP, PB, SS	Zinc Alloys	Air/gas (internal)	None	None	VII.F2.1-a VII.F4.1-a	None	F, 4, 5
Fire Dampers	FB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Fire Protection Program (**B.2.1.23**)	None	None	J, 5
Fire Dampers	FB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 5
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The LR scope for this system does not include drip pans and the moisture content in air in the duct does not result in an aggressive environment or a pooled water (wetted) environment. Therefore crevice corrosion, pitting corrosion, and MIC are not applicable aging effects.

4 The component type "Ductwork" includes fan housings, damper housings, screens and ductwork (ducts, hatches, hinges, & closures).

5 The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Aluminum Alloy and Copper Alloy	Inside Air (external)	None	None	VII.I.2-a	None	F, 2
Bolting	MC, SS	Copper Alloy	Outside Air (external)	None	None	VII.I.2-a	None	F, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 2
Ductwork	DP, PB, SS	Aluminum Alloy	Air/gas (internal)	None	None	VII.F1.1-a	None	F, 2
Ductwork	DP, PB, SS	Aluminum Alloy	Air/gas (internal)	None	None	VII.F4.1-a	None	F, 2
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII F1.1-a	None	I, 3
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII F4.1-a	None	I, 3
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.1-a	**3.3.1.5**	A

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.1-a	**3.3.1.5**	A
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Ductwork	DP, PB, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Ductwork	DP, PB, SS	Elastomer	Air/gas (internal)	None	None	VII.F1.1-b	None	I, 2
Ductwork	DP, PB, SS	Elastomer	Air/gas (internal)	None	None	VII.F4.1-b	None	I, 2
Ductwork	DP, PB, SS	Elastomer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Ductwork	DP, PB, SS	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Ductwork	DP, PB, SS	Stainless Steel	Air/gas (internal)	None	None	VII.F1.1-a	None	F, 2
Ductwork	DP, PB, SS	Stainless Steel	Air/gas (internal)	None	None	VII.F4.1-a	None	F, 2
Ductwork	DP, PB, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fire Dampers	FB, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.1-a	**3.3.1.5**	C, 4
Fire Dampers	FB, PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.1-a	**3.3.1.5**	C, 4
Fire Dampers	FB, PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII F1.1-a	None	I, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII F4.1-a	None	I, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.1-a	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	VII.F1.3-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.1-a	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	VII.F4.3-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	G, 5
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	G, 5
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII F1.3-a	**3.3.1.15**	A

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	H, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	None	H, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	**3.3.1.15**	A
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) Freon	None	None	VII.F1.3-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) Freon	None	None	VII.F4.3-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	F, 5
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.3-a	None	F, 6
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	F, 5
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.3-a	None	F, 6

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.3-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.3-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	None	H, 4
Fittings	PB	Elastomer	Air/gas (internal)	None	None	VII.F1.1-b	None	I, 2
Fittings	PB	Elastomer	Air/gas (internal)	None	None	VII.F4.1-b	None	I, 2
Fittings	PB	Elastomer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Glass	Inside Air (external)	None	None	None	None	J, 2
Fittings	PB	Glass	Air/gas (internal)	None	None	None	None	J, 2
Fittings	PB	Glass	Air/gas (internal)	None	None	VII.F1.1-a	None	F, 2
Fittings	PB	Glass	Treated Water (internal) Freon	None	None	VII.F1.3-a	None	F, 2
Fittings	PB	Glass	Freon	None	None	VII.F1.3-a	None	F, 2
Fittings	PB	Glass	Raw Water (internal) Potable Water	None	None	VII.F4.3-a	None	F, 2
Fittings	PB	Glass	Treated Water (internal) Freon	None	None	VII.F4.3-a	None	F, 2
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.F1.1-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Copper Alloy	Air/gas (internal) Freon	None	None	VII.F1.3-a	None	F, 2
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.F4.1-a	None	F, 2
Fittings	PB	Copper Alloy	Air/gas (internal) Freon	None	None	VII.F4.3-a	None	F, 2
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.3-a	None	F, 6
Fittings	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	F, 5
Fittings	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.3-a	None	F, 6
Fittings	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	F, 5
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	F, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.3-a	None	F, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	None	F, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.3-a	None	F, 4
Fittings	PB	Polymer	Air/gas (internal)	None	None	VII.F1.1-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Polymer	Air/gas (internal)	None	None	VII.F4.1-a	None	F, 2
Fittings	PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal) Freon	None	None	VII.F1.1-a	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal) Freon	None	None	VII.F1.3-a	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.F4.1-a	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal) Freon	None	None	VII.F4.3-a	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Stainless Steel	Raw Water (internal) Potable Water	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	F, 5
Fittings	PB	Stainless Steel	Raw Water (internal) Potable Water	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	F, 5
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	F, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connectors	PB	Elastomer	Air/gas (internal)	None	None	VII.F1.1-b	None	I, 2
Flexible Connectors	PB	Elastomer	Air/gas (internal)	None	None	VII.F4.1-b	None	I, 2
Flexible Connectors	PB	Elastomer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Flexible Connectors	PB	Polymer	Air/gas (internal)	None	None	None	None	J, 2
Flexible Connectors	PB	Polymer	Air/gas (internal)	None	None	VII.F4.1-b	None	F, 2
Flexible Connectors	PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Flexible Connectors	PB	Stainless Steel	Raw Water (internal) Potable Water	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 5
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 5
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.1-b	None	F, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) Freon	None	None	VII.F1.2-a	None	F, 2
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) Freon	None	None	VII.F4.2-a	None	F, 2
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	F, 6
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 5
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to MIC, biofouling, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	G, 6
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 5
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	F, 4

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal) Freon	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII F1.2-a	**3.3.1.5**	A
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal) Freon	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII F4.2-a	**3.3.1.5**	A
Heat Exchangers	HT, PB	Aluminum Alloy	Air/gas (internal)	Crack initiation/growth due to SCC. Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal)	Fouling product buildup due to particulate.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	H, 4
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal)	None	None	VII.F1.2-a	None	G, 2
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal)	None	None	VII.F4.2-a	None	G, 2
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal)	Fouling product buildup due to particulate.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	H, 4
Heat Exchangers	HT, PB	Aluminum Alloy	Air/gas (internal)	Crack initiation/growth due to SCC. Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Copper Alloy	Lubricating Oil (internal)	None	None	VII.F1.2-a	None	G, 2
Heat Exchangers	HT, PB	Copper Alloy	Lubricating Oil (internal)	None	None	VII.F4.2-a	None	G, 2
Heat Exchangers	HT, PB	Aluminum Alloy and Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 2
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	G, 6
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	G, 4
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Fouling product buildup due to biological and particulate. Loss of material due to MIC, biofouling, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F1.2-a	None	G, 4
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal) Potable Water	Fouling product buildup due to particulate. Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	G, 5
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal) Potable Water	Fouling product buildup due to particulate. Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	G, 5
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Fouling product buildup due to biological and particulate. Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F4.2-a	None	G, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.2-a	None	G, 6
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Fouling product buildup due to particulate. Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.2-a	None	G, 4
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F1.2-a	None	G, 4
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Fouling product buildup due to particulate. Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.2-a	None	G, 4
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.F4.2-a	None	G, 4
Heat Exchangers	HT, PB	Stainless Steel	Air/gas (internal) Freon	None	None	VII.F1.2-a	None	F, 2
Heat Exchangers	HT, PB	Stainless Steel	Air/gas (internal)	Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Stainless Steel	Air/gas (internal) Freon	None	None	VII.F4.2-a	None	F, 2
Heat Exchangers	HT, PB	Stainless Steel	Air/gas (internal)	Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 4
Heat Exchangers	HT, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Stainless Steel	Raw Water (internal)	Fouling product buildup due to biological and particulate. Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.F1.2-a	None	F, 4
Heat Exchangers	HT, PB	Stainless Steel	Raw Water (internal)	Crack initiation/growth due to SCC. Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 5
Heat Exchangers	HT, PB	Stainless Steel	Raw Water (internal)	Crack initiation/growth due to SCC. Fouling product buildup due to particulate. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 5
Heaters	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.2-a	None	F, 4
Heaters	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.2-a	None	F, 4
Heaters	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	VII.F1.3-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	G, 4

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	VII.F4.3-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	G, 5
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	G, 5
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII F1.3-a	**3.3.1.15**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII F4.3-a	**3.3.1.15**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	H, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	None	H, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Raw Water (internal) Potable Water	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F1.3-a	None	F, 5
Piping	PB	Stainless Steel	Raw Water (internal) Potable Water	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.F4.3-a	None	F, 5
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	F, 4
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F4.3-a	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Pumps	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 6, 7
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4, 7
Pumps	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 2

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Refrigerant Compressor	PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Refrigerant Compressor	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Refrigerant Compressor	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Refrigerant Compressor	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Refrigerant Compressor	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Strainers	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 2, 7
Strainers	DP, PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	DP, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	H, 4, 7
Strainers	DP, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	**3.3.1.15**	C, 4, 7
Strainers	DP, PB	Copper Alloy	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Strainers	DP, PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 2, 7
Strainers	DP, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4, 7
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	A
Tanks	PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	**3.3.1.15**	C, 4, 7
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	H, 4, 7
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 2, 7
Tubing	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 2, 7

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Tubing	PB	Aluminum Alloy Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Tubing	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 6, 7
Tubing	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4, 7
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Tubing	PB	Polymer	Air/gas (internal)	None	None	None	None	J, 2, 7
Tubing	PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2, 7
Tubing	PB	Stainless Steel	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4, 7
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	**3.3.1.15**	C, 4, 7
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.F1.3-a	None	H, 4, 7
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4, 7
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal) Potable Water	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 6, 7
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4, 7
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Valves	PB	Copper Alloy	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 2, 7
Valves	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 2, 7
Valves	PB	Aluminum Alloy and Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 6, 7
Valves	PB	Copper Alloy	Raw Water (internal) Potable Water	Loss of material due to crevice, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4, 7
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7
Valves	PB	Polymer	Air/gas (internal)	None	None	None	None	J, 2, 7
Valves	PB	Polymer	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.9: Heating, Ventilation, and Air Conditioning System (031) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2, 7
Valves	PB	Stainless Steel	Air/gas (internal) Freon	None	None	None	None	J, 2, 7
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Stainless Steel	Raw Water (internal) Potable Water	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 5, 7
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 4, 7

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.”

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.”

Note F Material not in NUREG-1801 item for this component.]

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking is not considered a license renewal concern due to high cycle fatigue since it would be discovered during the current license period and corrected. Therefore, SCC and cyclic load are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 Crevice corrosion, pitting corrosion and MIC require wetted conditions. Wetted conditions within the ventilation system are confined to the cooling coils and associated housing which are evaluated under the group "Heat Exchangers". This is consistent with industry guidance.

4 The aging effects identified for this material and environment combination is consistent with industry guidance.

5 The raw water environment identified for this component is actually potable water. Potable water is chlorinated, which prevents MIC and biofouling, but creates a possibility of SCC for stainless steels.

6 The raw water environment identified for this component is actually potable water. Selective leaching is considered a concern in a potable water environment.

7 These components are addressed in both the Control Room Area Ventilation and Diesel Generator Ventilation System.

Table 3.3.2.10: Control Air System (032) - Summary of Aging Management

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (**B.2.1.21**)	VII.D.1-a	**3.3.1.19**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.D.1-a	None	I, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.D.1-a	None	G, 3
Fittings	PB	Cast Iron and Cast Iron Alloys	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (**B.2.1.21**)	VII.D.1-a	None	F, 6
Fittings	PB	Cast Iron and Cast Iron Alloys	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 6
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.D.1-a	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.D.1-a	None	G, 3
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.D.1-a	None	G, 3
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.D.1-a	None	F, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Flexible Connectors	PB	Nickel Alloy	Air/gas (internal)	None	None	None	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.10: Control Air System (032) - Summary of Aging Management

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connectors	PB	Nickel Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Flexible Connectors	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Heat Exchangers	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (**B.2.1.21**)	VII.D.1-a	**3.3.1.19**	C, 6
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (**B.2.1.21**)	VII.D.1-a	**3.3.1.19**	A
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.D.1-a	None	I, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.D.1-a	None	G, 3
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	VII.D.1-a	None	F, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Restricting Orifice	FR, PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (**B.2.1.21**)	VII.D.1-a	**3.3.1.19**	C, 6

Table 3.3.2.10: Control Air System (032) - Summary of Aging Management

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 4
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 3
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.D.2-a	None	I, 4
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (**B.2.1.21**)	VII.D.2-a	**3.3.1.19**	A
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.D.2-a	None	G, 3
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	VII.D.2-a	None	F, 4
Valves	PB	Aluminum Alloy	Air/gas (internal)	None	None	VII.D.2-a	None	F, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 5

Table 3.3.2.10: Control Air System (032) - Summary of Aging Management

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.D.2-a	None	G, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.D.2-a	None	G, 3
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	VII.D.2-a	None	F, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 Control Air System components are not subjected to the pooled water environment. Therefore, pitting corrosion is not an applicable aging effect.

3 The treated water from the RBCCW system is circulated through the air compressors, after coolers, and associated piping, tubing, and valves. The aging effects identified for this material/environment combination are consistent with industry guidance.

4 Control Air System components are not subjected to the pooled water environment. Therefore, there are no aging effects requiring management for this material/environment combination.

5 There are no aging effects requiring management for this material/environment combination. This is consistent with industry guidance.

6 The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.11: Service Air System (033) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel,	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, BF-2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel,	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel,	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to genera corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.12: CO_2 System (039) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Ductwork	PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2, 3, 4
Ductwork	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Ductwork	PB, SS	Elastomers	Air/gas (internal)	None	None	None	None	J. 2
Ductwork	PB, SS	Elastomers	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fire Dampers	FB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion..	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Fire Dampers	FB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to pitting corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	H, 8
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general and pitting corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 5, 8
Fittings	PB	Glass	Air/gas (internal)	None	None	None	None	J, 6
Fittings	PB	Glass	Inside Air (external)	None	None	VII.I.1-b	None	F, 6
Fittings	PB	Aluminum Alloy Copper Alloy	Air/gas (internal)	None	None	None	None	J, 6

Table 3.3.2.12: CO_2 System (039) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Aluminum Alloy Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 6
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 6
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 6
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to pitting corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**None**	H, 8
Rupture Disk	PB	Nickel Based Alloys	Air/gas (internal)	None	None	None	None	J, 6
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal) - Co2	None	None	None	None	J, 7
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Tubing	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2, 4
Tubing	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 6
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 6
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 6
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 6
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 2, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.12: CO_2 System (039) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to pitting corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	H, 8
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 6
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 6
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 6
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 6

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environmental combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due t high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 Ductwork includes damper frames.

4 Components that are only exposed to a CO_2 environment do not experience this aging effect.

5 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

6 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

7 Carbon steel has no aging effects requiring management in a CO_2 environment.

8 Components on the discharge from the CO_2 tanks are exposed to cold CO_2 internally. This results in condensation of the external surfaces of these components and has resulted in external pitting corrosion at BFN.

Table 3.3.2.13: Station Drainage System (040) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Outside Air (external)	None	None	V.E.2-a	None	F, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3

Table 3.3.2.13: Station Drainage System (040) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	G, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Nickel Alloy	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V C.1-a	None	I, 5
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 6
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Fittings	PB	Glass	Treated Water (internal)	None	None	V.C.1-a	None	F, 3
Fittings	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Nickel Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Fittings	PB	Polymer	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Fittings	PB	Polymer	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Polymer	Treated Water (internal)	None	None	V.C.1-a	None	F, 3
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Fittings - RCPB	PB	Stainless Steel	Air/gas (internal)	None	None	IV.C1.1-i	None	G, 3
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 3
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 4

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Flexible Connectors	PB	Nickel Alloy	Air/gas (internal)	None	None	None	None	J, 3
Flexible Connectors	PB	Nickel Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Flexible Connectors	PB	Nickel Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Flexible Connectors	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Heat Exchangers	PB	Nickel Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Heat Exchangers	PB	Nickel Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4
Heat Exchangers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D, 4
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V C.1-a	**3.2.1.3, 3.2.1.5**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 6
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 3
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Piping- RCPB	PB	Stainless Steel	Air/gas (internal)	None	None	IV.C1.1-i	None	G, 3
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 3
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4
Pumps	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Pumps	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Pumps	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Strainers	PB	Polymer	Inside Air (external)	None	None	V.E.1-b	None	F, 3

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	PB	Polymer	Treated Water (internal)	None	None	None	None	J, 3
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Strainers	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Strainers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	D
Tanks	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Tanks	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Tanks	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 4
Tubing	PB	Polymer	Air/gas (internal)	None	None	None	None	J, 3
Tubing	PB	Polymer	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Tubing	PB	Polymer	Treated Water (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 3
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	C
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice corrosion, general corrosion, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	H, 6
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 6
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 5
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Valves	PB	Polymer	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Valves	PB	Polymer	Inside Air (external)	None	None	V.E.1-b	None	F, 3

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Polymer	Treated Water (internal)	None	None	V.C.1-a	None	F, 3
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V C.1-b	None	I, 5
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	None	H, 6
Valves - RCPB	PB	Stainless Steel	Air/gas (internal)	None	None	IV.C1.3-c	None	G, 3
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 3
Valves - RCPB	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.C1.3-b	**3.1.1.23**	A
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	H, 6

Table 3.3.2.14: Sampling and Water Quality System (043) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 Wear is an aging mechanism that is only applicable to RCPB bolting. This is consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 Based on system design and operating history, MIC and biofouling are not applicable to the treated water portions of this system.

6 The additional aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.15: Building Heat System (044) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, pitting, and crevice corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3** **3.2.1.5**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Heaters	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Heaters	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Heaters	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Heaters	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, pitting, and crevice corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3** **3.2.1.5**	D, 3
Heaters	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4

Table 3.3.2.15: Building Heat System (044) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heaters	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, pitting, and crevice corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3** **3.2.1.5**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, pitting, and crevice corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3** **3.2.1.5**	D
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general, pitting, and crevice corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3** **3.2.1.5**	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 Based on system design (i.e., demineralized water makeup and no raw water heat exchangers) and operating history, microbiologically influenced corrosion is not applicable to this system.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 There are no aging effects identified for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.16: Raw Water Chemical Treatment System (050) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	VII.I.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	E, 2
Fittings	PB	Nickel Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Nickel Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	F, 4
Fittings	PB	Polymer	Raw Water (internal)	None	None	VII.C1.1-a	None	F, 3
Fittings	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	E, 2
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	E, 2
Piping	PB	Nickel Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Nickel Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.I.1-b	None	F, 4
Piping	PB	Nickel Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	F, 4
Piping	PB	Polymer	Raw Water (internal)	None	None	VII.C1.1-a	None	F, 3

Table 3.3.2.16: Raw Water Chemical Treatment System (050) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	E, 2
Restricting Orifice	FR	Nickel Alloy	Raw Water (external)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.I.1-b	None	F, 4
Restricting Orifice	FR	Nickel Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.4-a	None	F, 4
Valves	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC,. crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.2-a	None	E, 2
Valves	PB	Polymer	Raw Water (internal)	None	None	VII.C1.2-a	None	F, 3
Valves	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.2-a	None	E, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note E Consistent with NUREG-1801 item for material, environment, and aging effect, a different aging management program is credited.

Note F Material not in NUREG-1801 item for this component.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking is not considered a license renewal concern due to high cycle fatigue since it would be discovered during the current license period and corrected. Therefore, SCC and cyclic load are not concerns for BFN license renewal.

2 The interfaces between the Raw Water Chemical Treatment System and the Residual Heat Removal Service Water and the Emergency Equipment Cooling Water systems are exposed to a raw water and chemical mixture which includes corrosive biocides, liquid inhibitors formulated to control corrosion, and dispersants for suspended material such as silt and metal oxides. The biocide is mixed with the inhibitors in a raw water environment. Therefore, there are no additional aging effects for the in-scope components.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 Nickel based alloys in a raw water environment have aging effects similar to stainless steel. The interfaces between the Raw Water Chemical Treatment System and the Residual Heat Removal Service Water and the Emergency Equipment Cooling Water systems are exposed to a raw water and chemical mixture which includes corrosive biocides, liquid inhibitors formulated to control corrosion, and dispersants for suspended material such as silt and metal oxides. The biocide is mixed with the inhibitors in a raw water environment. Therefore, there are no additional aging effects for the in-scope components.

Table 3.3.2.17: Demineralizer Backwash Air System (053) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Traps	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) - pooled moisture	Loss of material due to general, crevice, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 2
Traps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 2
Traps	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal) - pooled moisture	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 2
Traps	PB	Copper Alloy	Air/gas (internal) - pooled moisture	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Traps	PB	Copper Alloy	Air/gas (internal) - pooled moisture	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.17: Demineralizer Backwash Air System (053) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Traps	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 There are no applicable aging effects identified for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.18: Standby Liquid Control System (063) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 3
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	F, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water Borated (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	F, 4
Fittings	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Aluminum Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion. Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Fittings	PB	Polymer - Delrin	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Polymer - Delrin	Treated Water (internal)	None	None	None	None	J, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.E2.1-a	None	G, 2

Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.18: Standby Liquid Control System (063) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	G, 4
Fittings	PB	Stainless Steel	Treated Water (internal) Borated	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	H, 5, 7
Fittings	PB	Stainless Steel	Treated Water (internal) Borated	None	None	VII.E2.1-a	None	I, 6
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 2
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program(**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 5
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A

Table 3.3.2.18: Standby Liquid Control System (063) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	F, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water Borated (internal)	Loss of material due to crevice, galvanic, general and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	F, 4
Piping	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Piping	PB	Aluminum Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion. Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Piping	PB	Stainless Steel	Treated Water (internal) Borated	None	None	VII.E2.1-a	None	I, 6
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	VII.E2.1-a	None	G, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	G, 2
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	G, 4
Piping	PB	Stainless Steel	Treated Water (internal) Borated	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.1-a	None	H, 5, 7
Piping - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.1-i	None	G, 2

Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.18: Standby Liquid Control System (063) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 2
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 5
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack Initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Pumps	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Pumps	PB	Stainless Steel	Treated Water (internal) Borated	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E2.4-a	None	H, 5, 7
Pumps	PB	Stainless Steel	Treated Water (internal) Borated	None	None	VII.E2.4-a	None	I, 6
Tanks	PB	Stainless Steel	Air/gas (internal)	None	None	VII.E2.2-a	None	G, 2
Tanks	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2

Table 3.3.2.18: Standby Liquid Control System (063) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Stainless Steel	Treated Water (internal) Borated	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.E2.2-a	None	H, 5, 7
Tanks	PB	Stainless Steel	Treated Water (internal) Borated	None	None	VII.E2.2-a	None	I, 6
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Tubing	PB	Stainless Steel	Treated Water (internal) Borated	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.E2.1-a	None	H, 5, 7
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	VII.E2.3-a	None	G, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 2
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.E2.3-a	None	G, 5
Valves	PB	Stainless Steel	Treated Water (internal) Borated	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.E2.3-a	None	H, 5, 7
Valves	PB	Stainless Steel	Treated Water (internal) Borated	None	None	VII.E2.3-a	None	I, 6
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 2
Valves - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.3-c	None	G, 2

Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.18: Standby Liquid Control System (063) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	H, 5
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack Initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) BWR Stress Corrosion Cracking Program (**B.2.1.10**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack Initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 Wear is an aging mechanism that is only applicable to RCPB bolting. This is consistent with industry guidance.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

6 Borated water sodium pentaborate solution temperature and concentration are maintained in accordance with Technical Specification 3.1.7 Surveillance Requirements. Therefore SCC is not a concern for stainless steel components in treated borated water, as the normal operating temperature does not exceed 140°F.

7 Borated water sodium pentaborate solution temperature and concentration are maintained in accordance with Technical Specification 3.1.7 Surveillance Requirements.

Table 3.3.2.19: Off-Gas System (066) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Ductwork	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.B.1-a	**3.2.1.3**	A
Ductwork	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.B.1-a	**3.2.1.3**	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	V.B.1-a	None	F, 2
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.B.1-a	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.B.1-a	**3.2.1.3**	C
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination.

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Buried (external)	Loss of bolting function due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**) Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	None	G, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	VII.I.2-b	None	I, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Fittings	PB	Carbon and Low Alloy Steel	Embedded/encased	None	None	VII.I.1-b	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, galvanic and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Fittings	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, galvanic and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	None	F, 1
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.C1.1-a	None	G, 3
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Fittings	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.1-a	**3.3.1.29**	A
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.C1.1-a	None	G, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connectors	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Flexible Connectors	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, galvanic and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Flexible Connectors	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.3-a	None	G, 1
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, galvanic and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.3-a	**3.3.1.17**	A
Heat Exchangers	HT, PB	Aluminum Alloy	Air/gas (internal)	Fouling product buildup due to particulate	One-Time Inspection Program (**B.2.1.29**)	VII.C1.3-a	None	G, 1
Heat Exchangers	HT, PB	Copper Alloy	Air/gas (internal)	Fouling product buildup due to particulate	One-Time Inspection Program (**B.2.1.29**)	VII.C1.3-a	None	G, 1
Heat Exchangers	HT, PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.3-a	**3.3.1.29**	A
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.3-a	**3.3.1.17**	A

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Fouling product buildup due to biological and particulate.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.3-b	**3.3.1.17**	A
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general and pitting corrosion.	Buried Piping and Tanks Inspection Program (**B.2.1.31**)	VII.I.1-b	None	G, 1
Piping	PB	Carbon and Low Alloy Steel	Embedded/encased	None	None	VII.I.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	VII.C1.1-a	None	G, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	FR, PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.4-a	**3.3.1.17**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	**3.3.1.17**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	None	H, 1
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 1
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	None	F, 1
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.6-a	None	F, 1
Strainers	DP, PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Strainers	DP, PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.6-a	**3.3.1.17**	A
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 3
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.1-a	**3.3.1.29**	A
Tubing	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion..	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	C
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C1.2-a	None	G, 1
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	**3.3.1.17**	A
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	None	H, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	F, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	None	F, 1
Valves	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.C1.2-a	None	F, 1
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Copper Alloy	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	3.3.1.17	A
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to galvanic corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	None	H, 1
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.C1.2-a	3.3.1.29	A
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	VII.C1.2-a	None	G, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Table 3.3.2.20: Emergency Equipment Cooling Water System (067) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Outside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.C1.2-a	3.3.1.17	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects identified for this material/environment combination are consistent with industry guidance.

2 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 Due to the design of the atmospheric vents, water will not pool thereby preventing crevice corrosion, pitting corrosion, microbiological influenced corrosion and galvanic corrosion. This is consistent with industry guidance.

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 5
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.1-a	None	F, 3
Fittings	PB	Glass	Treated Water (internal)	None	None	None	None	J, 5
Fittings	PB	Glass	Inside Air (external)	None	None	VII.I.1-b	None	F, 5

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.E3.1-a	None	G, 5
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.1-a	None	H, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Reactor Water Cleanup System Program (**B.2.1.22**) Chemistry Control Program (**B.2.1.5**)	VII.E3.1-a	**3.3.1.26**	B
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VII.E3.1-b	**3.3.1.3**	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 5
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	F, 3
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Fittings - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.1-i	None	G, 5
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 5

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program **B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	H, 4
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.1-f	**3.1.1.29**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.E3.4-b	None	F, 3
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 3
Heat Exchangers	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.3-d	None	H, 3
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.3-d	**3.3.1.4**	B
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.4-a	**3.3.1.4**	B
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.1-a	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	VII.E3.1-a	None	G, 5
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Reactor Water Cleanup System Program (**B.2.1.22**) Chemistry Control Program (**B.2.1.5**)	VII.E3.1-a	**3.3.1.26**	B
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.1-a	None	H, 4
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VII.E3.1-b	**3.3.1.3**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 5
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	F, 3
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Piping - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.1-i	None	G, 5
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-f	None	G, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.1-f	**3.1.1.29**	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-f	None	H, 4
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-h	**3.1.1.1**	A
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.E3.2-a	None	F, 3
Pumps	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VII.E3.2-b	3.3.1.3	A
Restricting Orifice	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Restricting Orifice	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Strainers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.E3.1-a	None	J, 3
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Strainers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 3
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Tanks	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 5

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Traps	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Traps	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Traps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 4
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 5
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Reactor Water Cleanup System Program (**B.2.1.22**) Chemistry Control Program (**B.2.1.5**)	VII.E3.1-a	**3.3.1.26**	D
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 5
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-a	None	G, 5
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 5
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**)	None	None	J, 3
Valves	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	None	None	J, 3
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3

Table 3.3.2.21: Reactor Water Cleanup System (069) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-a	None	H, 4
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A
Valves - RCPB	PB	Stainless Steel	Air/Gas (internal)	None	None	IV.C1.3-c	None	G, 5
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 5
Valves - RCPB	PB	Stainless Steel - CASS	Treated Water (internal)	Change in material properties/reduction in fracture toughness due to thermal aging.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)	IV.C1.3-b	**3.1.1.23**	A
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	H, 3
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Wear is an aging mechanism that is only applicable to RCPB bolting. This is consistent with industry guidance.

2 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for license renewal.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

5 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.22: Reactor Building Closed Cooling Water System (070) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	**3.3.1.15**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	H, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy - gray	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.1-a	None	F, 2
Fittings	PB	Glass	Treated Water (internal) Air gas	None	None	VII.C2.1-a	None	F, 4
Fittings	PB	Glass	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.C2.1-a	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4

Table 3.3.2.22: Reactor Building Closed Cooling Water System (070) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	F, 2
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.1-a	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	F, 2
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 2
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling and MIC. Loss of material due to crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	None	None	J, 2
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	H, 2
Heat Exchangers	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 4
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.22: Reactor Building Closed Cooling Water System (070) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling and MIC. Loss of material due to crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	None	None	J, 2
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 2
Heat Exchangers	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 2
Piping	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	**3.3.1.15**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	H, 3
Piping	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Piping	PB	Copper Alloy	Air/Gas (internal)	None	None	VII.C2.1-a	None	F, 5
Piping	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.1-a	None	F, 2
Piping	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	F, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4

Table 3.3.2.22: Reactor Building Closed Cooling Water System (070) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	F, 2
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.3-a	**3.3.1.15**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.3-a	None	H, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.3-a	**3.3.1.29**	A
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.3-a	**3.3.1.15**	A
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to galvanic and general corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.3-a	None	H, 3
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.1-a	None	C, 2
Strainers	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Strainers	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 2

Table 3.3.2.22: Reactor Building Closed Cooling Water System (070) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	PB	Cast Iron and Cast Iron Alloy -gray	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 2
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Strainers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 2
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.4-a	None	G, 2
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.4-a	**3.3.1.15**	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.4-a	None	H, 3
Tanks	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection (**B.2.1.29**)	VII.C2.4-a	None	F, 2
Tanks	PB	Cast Iron and Cast Iron Alloy - gray	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Tanks	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.4-a	None	F, 2
Tanks	PB	Cast Iron and Cast Iron Alloy - gray	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.4-a	None	F, 2
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4

Table 3.3.2.22: Reactor Building Closed Cooling Water System (070) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.2-a	**3.3.1.15**	A
Valves	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.C2.2-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.2-a	None	H, 3
Valves	PB	Aluminum Alloy	Air/gas (internal)	None	None	VII.C2.2-a	None	F, 4
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	VII.C2.2-a	None	F, 4
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.C2.2-a	None	F, 2
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C2.2-a	None	F, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII C2.2-a	**3.3.1.15**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 The additional aging effects identified for this material/environment combination are consistent with industry guidance.

4 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 3
Condenser	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Condenser	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Condenser	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Expansion Joint	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Expansion Joint	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 5
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	C, 7
Expansion Joint	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Expansion Joint	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Expansion Joint	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D
Expansion Joint	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 4
Fittings	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 4
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	V.D2.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	A, 7
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	V.D2.1-a	None	G, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy - gray	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.1-a	None	F, 4
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	V.D2.1-a	None	F, 3
Fittings	PB	Copper Alloy	Lubricating Oil (internal)	None	None	V.D2.1-a	None	F, 3
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.1-a	None	F, 4
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	F, 4
Fittings	PB	Copper Alloy and Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Glass	Air/gas (internal), Inside Air (external), Lubricating Oil (internal), Treated Water (internal)	None	None	V.D2.1-a	None	F, 3
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	G, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Stainless Steel	Lubricating Oil (internal)	None	None	V.D2.1-c	None	G, 3
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.1-c	None	H, 5
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (B.2.1.10) Chemistry Control Program (B.2.1.5)	V.D2.1-c	3.2.1.16	B
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	IV.C1.1-a	None	G, 4
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	G, 4
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-a	None	G, 6
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 6
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	IV.C1.1-a	3.1.1.25	A, 7
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-a	None	H, 5
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-e	3.1.1.1	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 3
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 4
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Flexible Connectors	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D, 4

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connectors	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.4-c	None	F, 4
Heat Exchangers	HT, PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.4-c	None	F, 4
Heat Exchangers	HT, PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Heat Exchangers	HT, PB	Copper Alloy	Lubricating Oil (internal)	None	None	V.D2.4-c	None	F, 3
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.4-c	None	F, 4
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Fouling product buildup due to particulates. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.4-c	None	F, 4
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	V.D2.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	None	H, 4

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Treated Water (external)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	A, 7
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.1-c	None	G, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 5
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	B
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	G, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	G, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-a	None	G, 6
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 6
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	H, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	IV.C1.1-a	3.1.1.25	A, 7
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-e	3.1.1.1	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 5
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 3
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	H, 5
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	**3.2.1.2, 3.2.1.4**	B
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	None	H, 6
Pumps	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	V.D2.2-a	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy - gray	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.2-a	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	None	F, 4
Pumps	PB	Copper Alloy	Air/gas (internal)	None	None	V.D2.2-a	None	F, 3
Pumps	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Pumps	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.2-a	None	F, 4
Pumps	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.2-a	None	F, 4
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Restricting Orifice	FR, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	FR, PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Restricting Orifice	FR, PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 5
Restricting Orifice	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	None	None	J, 3
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	C
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 5
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	D
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 4
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Strainers	DP, PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 3
Strainers	DP, PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Strainers	DP, PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Strainers	DP, PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 4
Tanks	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Tanks	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 4
Tanks	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Tanks	PB	Cast Iron and Cast Iron Alloy - gray	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 4
Traps	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Traps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	H, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.1-f	**3.2.1.14**	C
Tubing	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tubing	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Tubing	PB	Stainless Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.1-c	**3.2.1.16**	D
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-c	None	H, 5
Turbines	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Turbines	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Turbines	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.1-a	**3.2.1.2, 3.2.1.4**	D

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Turbines	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.1-a	None	H, 5
Turbines	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	V.D2.1-f	3.2.1.14	C, 7
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.3-b	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Valves	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	V.D2.3-b	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	V.D2.3-a	3.2.1.14	A, 7
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.3-b	3.2.1.2, 3.2.1.4	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.3-b	None	H, 5
Valves	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.D2.3-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	V.D2.3-b	None	G, 3
Valves	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	V.D2.3-a	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	V.D2.3-b	None	F, 4

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Cast Iron and Cast Iron Alloys	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.3-b	None	F, 4
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.D2.3-b	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Copper Alloy	Lubricating Oil (internal)	None	None	V.D2.3-b	None	G, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	V.D2.3-a	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-b	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.D2.3-b	None	F, 4
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.D2.3-c	None	G, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	V.D2.3-c	**3.2.1.16**	B
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.D2.3-c	None	H, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-a	None	G, 4
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 6
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.3-a	**3.1.1.25**	A, 7

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.23: Reactor Core Isolation Cooling System (071) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.3-a	None	H, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 3
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (B.2.1.10) Chemistry Control Program (B.2.1.5)	IV.C1.3-c	3.1.1.29	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	IV.C1.3-c	None	H, 5
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. Wear is an aging mechanism that is only applicable to RCPB bolting. This is consistent with industry guidance.
2. High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.
3. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.
4. The aging effects identified for this material/environment combination are consistent with industry guidance.
5. The additional aging effects identified for this material/environment combination are consistent with industry guidance.
6. There are no applicable aging effects for this material/environment combination. Carbon and low alloy steel is not susceptible to external Corrosion when the temperature is >212°F.
7. The identified aging mechanism is applicable to the turbine steam supply line and the turbine exhaust.

Table 3.3.2.24: Auxiliary Decay Heat Removal System (072) - Summary of Aging Management Evaluation (F.11)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Fittings	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Fittings	PB	Stainless Steel	Air/Gas (internal)	None	None	V.D2.1-a	None	F,
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 3
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	A
Heat Exchangers	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Heat Exchangers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Heat Exchangers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	C, 4
Piping	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 3
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.24: Auxiliary Decay Heat Removal System (072) - Summary of Aging Management Evaluation (F.11)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Pumps	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Pumps	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	C, 4
Strainers	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Strainers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	C, 4
Tubing	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	C, 4
Valves	PB	Stainless Steel	Air/Gas (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	None	G, 5
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-b	3.2.1.5	A
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 Based on system design (i.e., no raw water heat exchangers) and operating history, MIC and biofouling is not applicable to the treated water portions of this system.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 The ADHR System is neither heated nor dried following an outage. Therefore the ADHR System internal environment air and gas is assumed to contain moister in the form of treated water. The aging effects and AMP identified for stainless steel in a treated water environment are consistent with industry guidance.

Table 3.3.2.25: Radioactive Waste Treatment System (077) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	V.E.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	A
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V C.1-a	None	I, 5
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3

Table 3.3.2.25: Radioactive Waste Treatment System (077) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Elastomers - Neoprene and silicon	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Elastomers - Neoprene and silicon	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	A
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	C
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	V.E.1-b	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Raw Water (external)	Loss of material due to galvanic, biofouling, MIC, crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.E.1-b	None	G, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.25: Radioactive Waste Treatment System (077) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	A
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V C.1-a	None	I, 5
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	A
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	A
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Restricting Orifice	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Restricting Orifice	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	C
Restricting Orifice	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	C

Table 3.3.2.25: Radioactive Waste Treatment System (077) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Strainers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	C
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 6
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	C
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	C
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	C
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5, 3.2.1.6**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V C.1-a	None	I, 5

Table 3.3.2.25: Radioactive Waste Treatment System (077) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	A
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Copper Alloy	Lubricating Oil (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 4
Valves	PB	Copper Alloy	Lubricating Oil (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 3
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 The oil drain headers may contain significant moisture and contamination levels under stagnant conditions

5 Based on system design and operating history, MIC and biofouling are not applicable aging effects in a treated water portions of this system.

6 The upper area of a tank is not subject to a pooled water environment. The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.26: Fuel Pool Cooling And Cleanup System (078) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Treated Water (external)	Loss of bolting function due to crevice, general, and pitting corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	None	G, 2
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.2-a	None	F, 3
Bolting	MC, SS	Stainless Steel	Treated Water (external)	Loss of bolting function due to crevice and pitting corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	None	G, 2
Expansion Joint	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	None	None	J, 2
Expansion Joint	PB	Stainless Steel	Inside Air (external)	None	None	None	None	F, 3
Expansion Joint	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	3.3.1.1	D
Fittings	PB	Aluminum Alloy	Air/gas (internal)	None	None	VII.A4.1-a	None	G, 3
Fittings	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Aluminum Alloy	Treated Water (external)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.I.1-b	None	F, 2
Fittings	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	F, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.26: Fuel Pool Cooling And Cleanup System (078) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	F, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	G, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	VII.A4.1-a	None	G, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.I.1-b	None	F, 2
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	3.3.1.1	B
Heat Exchangers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A

Table 3.3.2.26: Fuel Pool Cooling And Cleanup System (078) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.A4.4-a	3.3.1.15	A
Heat Exchangers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.4-b	None	F, 2
Piping	PB	Aluminum Alloy	Air/gas (internal)	None	None	VII.A4.1-a	None	G, 3
Piping	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Aluminum Alloy	Treated Water (external)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.I.1-b	None	F, 2
Piping	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	None	F, 2
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	VII.A4.1-a	None	G, 3
Piping	PB	Stainless Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.26: Fuel Pool Cooling And Cleanup System (078) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.I.1-b	None	F, 2
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	3.3.1.1	B
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.6-a	None	F, 2
Restricting Orifice	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Restricting Orifice	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	3.3.1.1	D
Tanks	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Tanks	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tanks	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	3.3.1.1	D
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One-Time Inspection Program (B.2.1.29)	VII.A4.1-a	3.3.1.1	D
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.26: Fuel Pool Cooling And Cleanup System (078) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Aluminum Alloy	Treated Water (external)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.I.1-b	None	F, 2
Valves	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.A4.3-a	None	F, 2
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.A4.3-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.A4.3-a	None	F, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	VII.A4.3-a	**3.3.1.1**	B

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.27: Fuel Handling and Storage System (079) - Summary of Aging Management

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting & Fasteners	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to stress relaxation. Loss of material due to general corrosion.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	None	None	H, 1
Bolting & Fasteners	SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to stress relaxation.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	None	None	J, 1
Bolting & Fasteners	SS	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	None	None	J, 1
Bolting & Fasteners	SS	Stainless Steel	Treated Water (external)	Loss of bolting function due to stress relaxation.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	None	None	J, 1
Fuel Preparation Machines	SS	Aluminum Alloy	Inside Air (external)	None	None	VII.B.1-b	None	F, 2
Fuel Preparation Machines	SS	Aluminum Alloy	Treated Water (external)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.1-b	None	F, 1
Fuel Preparation Machines	SS	Stainless Steel	Inside Air (external)	None	None	VII.B.1-b	None	F, 2
Fuel Preparation Machines	SS	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.1-b	None	F, 1
Refueling Platform (Assembly, Rails, Main Fuel Grapple)	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.1-b	**3.3.1.16**	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.27: Fuel Handling and Storage System (079) - Summary of Aging Management

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Refueling Platform (Assembly, Rails, Main Fuel Grapple)	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to mechanical wear.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.2-a	**3.3.1.16**	B
Refueling Platform (Assembly, Rails, Main Fuel Grapple)	SS	Stainless Steel	Inside Air (external)	None	None	VII.B.1-b	None	F, 2
Refueling Platform (Assembly, Rails, Main Fuel Grapple)	SS	Stainless Steel	Treated Water (external)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.1-b	None	F, 1

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects identified for this material/environment combination are consistent with industry guidance.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Ductwork	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.F4.1-a	3.3.1.5	I, 2
Ductwork	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fan (Housings)	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII F4.1-a	3.3.1.5	I, 2
Fan (Housings)	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.3-a	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.3-a	None	I, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.4-a	None	I, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.4-a	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	3.3.1.15	A
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.4-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Glass	Treated Water (internal), Air/gas (internal), Inside Air (external)	None	None	VII.H2.1-a	None	F, 3
Fittings	PB	Glass	Lubricating Oil (internal), Air/gas (internal), Inside Air (external)	None	None	VII.H2.3-a	None	F, 3
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.1-a	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	VII.H2.1-a	None	F, 4
Flexible Connectors	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H.2.3-a	None	I, 2
Flexible Connectors	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	VII.H2.3-a	**3.3.1.5**	A
Flexible Connectors	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Flexible Connectors	PB	Elastomer	Treated Water (internal), Inside Air (external)	Elastomer degradation due to thermal exposure.	Systems Monitoring Program (B.2.1.39)	None	None	J, 4
Flexible Connectors	PB	Elastomer	Air/gas (internal)	Elastomer degradation due to thermal exposure.	One-Time Inspection Program (B.2.1.29)	VII.F4.1-b	3.3.1.2	A
Flexible Connectors	PB	Elastomer	Inside Air (external)	Loss of material due to wear.	Systems Monitoring Program (B.2.1.39)	VII.F4.1-c	3.3.1.2	A
Flexible Connectors	PB	Elastomer	Inside Air (external)	Elastomer degradation due to thermal exposure and ultraviolet radiation.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 4
Flexible Connectors	PB	Stainless Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Heat Exchangers	HT, PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.H2.1-b	3.3.1.17	A
Heat Exchangers	HT, PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Heat Exchangers	HT, PB	Aluminum Alloy and Copper Alloy	Lubricating Oil (internal)	None	None	VII.H2.1-a	None	I, 5
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Crack initiation/growth due to SCC. Fouling product buildup due to biological and particulate. Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	VII.H2.1-b	None	F, 6

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Heat Exchangers	HT, PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.17)	VII.H2.1-b	None	F, 6
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	None	F, 7
Heat Exchangers	HT, PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.17)	VII.H2.1-a	None	F, 7
Heaters	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Heaters	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	3.3.1.5	C
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.2.3-a	None	I, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H.2.4-a	3.3.1.5	A
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H.2.4-a	None	I, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.3-a	3.3.1.5	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Piping	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	3.3.1.15	A
Piping	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Pumps	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	3.3.1.15	C
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 4
Pumps	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Silencer	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H.2.4-a	3.3.1.5	A
Silencer	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.4-a	None	I, 3
Silencer	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.3-a	3.3.1.5	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.3-a	None	I, 2
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Strainers	DP, PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.3-a	None	G, 8
Strainers	DP, PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	3.3.1.15	C

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	VII.H2.1-a	None	H, 4
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	3.3.1.15	C
Tubing	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tubing	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.1-a	None	F, 3
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Tubing	PB	Copper Alloy	Lubricating Oil (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Tubing	PB	Copper Alloy	Lubricating Oil (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 4
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	None	F, 4
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.H2.1-a	None	F, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Tubing	PB	Stainless Steel	Lubricating Oil (internal)	None	None	None	None	J, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.28: Diesel Generator System (082) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Valves	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.H2.1-a	None	F, 4
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.1-a	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Copper Alloy	Lubricating Oil (internal)	Loss of material due to crevice and pitting corrosion.	One-Time Inspection Program (B.2.1.29)	None	None	J, 4
Valves	PB	Copper Alloy	Lubricating Oil (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 4
Valves	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	VII.H2.1-a	None	F, 4
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VII.H2.1-a	None	F, 4

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 Moist air is present in the diesel generator blower components. However, the lack of water pooling and contaminant concentration eliminates the potential for crevice and pitting corrosion. This is consistent with industry guidance.

3 There are no aging effects for this material/environment combination. This is consistent with industry guidance.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 This component type includes the lubricating oil cooler cast aluminum shell and the outside of the brass tubes. There are no aging effects for this material/environment combination. This is consistent with industry guidance.

6 This component type includes the raw water side of the cooling water heat exchangers. The aging effects identified are consistent with industry guidance.

7 This component type includes the inside of the brass tubes of the lubricating oil and cooling water heat exchangers. The aging effects identified for this material/environment combination are consistent with industry guidance.

8 Lubricating oil, exposed to moist air, is present in the diesel generator intake air filters. The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear and general corrosion.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3**, **3.2.1.5**	B
Fittings	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	V.C.1-a	None	F, 3
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Fittings	PB	Copper Alloy	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 4
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-h	None	G, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	IV.C1.1-h	None	H, 3
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	IV.C1.1-i	None	H, 3
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 3
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.3-a	None	F, 7
Heat Exchangers	PB	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.3-a	None	F, 7
Heat Exchangers	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.3-a	**3.3.1.29**	A
Heat Exchangers	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.3-a	**3.3.1.17**	A
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G,3
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.C2.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, general, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.1-a	**3.3.1.17**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 5
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 4
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-h	None	G, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-h	None	H, 3
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3
Pumps	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3**, **3.2.1.5**	D
Pumps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Pumps	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 7
Pumps	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	VII.C2.3-a	None	G, 4
Restricting Orifice	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Restricting Orifice	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Rupture Disk	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Rupture Disk	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Strainer - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 4
Strainer - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Strainers	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Strainers	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	None	None	J, 4
Strainers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3**, **3.2.1.5**	D
Strainers	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Strainers	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program(**B.2.1.29**)	V.C.1-a	None	H, 3
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3** **3.2.1.5**	D
Tanks	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Tanks	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tanks	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 4
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	D
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 4
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 7
Valves	PB	Cast Iron and Cast Iron Alloy	Lubricating Oil (internal)	None	None	VII.C2.2-a	None	G, 4
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 4
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VII.C1.2-a	**3.3.1.29**	A
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to crevice and pitting corrosion. Loss of material due to biofouling and MIC.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	VII.C1.2-a	**3.3.1.17**	A
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 4

Table 3.3.2.29: Control Rod Drive System (085) - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	V.C.1-b	**3.2.1.5**	B
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-d	None	G, 6
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, galvanic, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-d	None	H, 3
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 4
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking Program (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	H, 3

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Wear is an aging mechanism that is only applicable to RCPB bolting. This is consistent with industry guidance.

2 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

5 Based on system design (i.e., no raw water) and operating history, MIC and biofouling were determined to be not applicable to the treated water portions of this system.

6 The aging effects identified for this material/environment combination are consistent with industry guidance. Carbon and low alloy steels are not susceptible to external general corrosion when the temperature is greater than 212°F.

7 This item includes the heat exchanger channel head. The aging effects and aging management programs are consistent with industry guidance.

Table 3.3.2.30: Diesel Generator Starting Air System (086) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	VII.I.2-a	**3.3.1.24**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Diesel Air Start Motor	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (**B.2.1.41**)	VII.H2.2-a	**3.3.1.5**	A
Diesel Air Start Motor	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 2
Diesel Air Start Motor	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Diesel Air Start Motor	PB	Aluminum Alloy	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Diesel Air Start Motor	PB	Aluminum Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (**B.2.1.41**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.2-a	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Lubricating Oil (internal)	None	None	VII.H2.2-a	None	G, 3
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (**B.2.1.41**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.2-a	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	None	F, 2
Fittings	PB	Glass	Inside Air (external)	None	None	None	None	J, 3
Fittings	PB	Glass	Lubricating Oil (internal)	None	None	None	None	J, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.30: Diesel Generator Starting Air System (086) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Fittings	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Fittings	PB	Stainless Steel	Air/gas (internal) - dry air	None	None	VII.H2.2-a	None	F, 3
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Flexible Connectors	PB	Elastomer	Air/gas (internal) Inside Air (external)	None	None	None	None	J, 3
Flexible Connectors	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Flexible Connectors	PB	Copper Alloy	Inside Air (external)	None	None	None	None	J, 3
Flexible Connectors	PB	Stainless Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Flexible Connectors	PB	Stainless Steel	Inside Air (external)	None	None	None	None	J, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 3
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (**B.2.1.41**) One-Time Inspection Program (**B.2.1.29**)	VII.H2.2-a	**3.3.1.5**	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Piping	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.30: Diesel Generator Starting Air System (086) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Strainers	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (B.2.1.41)	VII.H2.2-a	3.3.1.5	A
Strainers	DP, PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 3
Strainers	DP, PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (B.2.1.41)	VII.H2.2-a	None	F, 4
Strainers	DP, PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 4
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 3
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (B.2.1.41) One-Time Inspection Program (B.2.1.29)	VII.H2.2-a	3.3.1.5	A
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tubing	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 3
Tubing	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (B.2.1.41) One-Time Inspection Program (B.2.1.29)	VII.H2.2-a	3.3.1.5	A
Tubing	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Tubing	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.30: Diesel Generator Starting Air System (086) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Diesel Starting Air Program (**B.2.1.41**)	VII.H2.2-a	**3.3.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VII.I.1-b	**3.3.1.5**	A
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	PB	Copper Alloy	Lubricating Oil (internal)	None	None	None	None	J, 3
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	VII.H2.2-a	None	F, 3
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN. Cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 Pitting and crevice corrosion are not applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.31: Radiation Monitoring System (090) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	V.E.2-a	3.2.1.18	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	V.E.2-a	None	F, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (B.2.1.29)	V.C.1-a	None	G, 3
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	V.E.1-b	3.2.1.10	A
Fittings	PB	Glass	Treated Water (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Glass	Raw Water (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, and pitting corrosion.	Open-Cycle Cooling Water System Program (B.2.1.17)	V.C.1-b	3.2.1.5, 3.2.1.6	A
Fittings	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 4
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (B.2.1.18)	V.C.1-b	3.2.1.5	A
Flex Hose	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.31: Radiation Monitoring System (090) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Flex Hose	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Piping	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 4
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	V.C.1-b	**3.2.1.5**	A
Pumps	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 2
Pumps	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Pumps	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Pumps	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Pumps	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	J, 3
Pumps	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	None	None	J, 3
Pumps	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice, galvanic, and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	None	None	J, 3
Strainers	PB	Glass	Air/gas (internal)	None	None	None	None	J, 2
Strainers	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Strainers	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 2

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.3.2.31: Radiation Monitoring System (090) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers	PB	Copper Alloy	Air/gas (internal)	None	None	None	None	J, 2
Strainers	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Strainers	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Strainers	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Strainers	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Traps	PB	Glass	Air/gas (internal)	None	None	None	None	J, 2
Traps	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Traps	PB	Aluminum Alloy	Air/gas (internal)	None	None	None	None	J, 2
Traps	PB	Aluminum Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Traps	PB	Aluminum Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, galvanic, and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	None	None	J, 3
Traps	PB	Aluminum Alloy	Raw Water (internal)	Crack initiation/growth due to SCC.	One-Time Inspection Program (**B.2.1.29**)	None	None	J, 3
Traps	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2
Traps	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Polymer – Tygon Tubing	Air/gas (internal)	None	None	None	None	J, 2
Tubing	PB	Polymer – Tygon Tubing	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 2

Table 3.3.2.31: Radiation Monitoring System (090) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Tubing	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	C, 3
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	V.C.1-b	**3.2.1.5**	C, 3
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One-Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 3
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-a	None	F, 3
Valves	PB	Copper Alloy	Raw Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 3
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 2
Valves	PB	Stainless Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice and pitting corrosion.	Open-Cycle Cooling Water System Program (**B.2.1.17**)	V.C.1-b	**3.2.1.5, 3.2.1.6**	A
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Closed-Cycle Cooling Water System Program (**B.2.1.18**)	V.C.1-b	**3.2.1.5**	A
Valves	PB	Stainless Steel	Treated Water (internal)	None	None	V.C.1-b	None	I, 4

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 High yield strength heat-treated bolting is not used at BFN, and cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered during the current license period and corrected. Therefore, SCC and cracking due to cyclic loading are not concerns for BFN license renewal.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

4 Based on system design and operating history, MIC and biofouling are not applicable to the treated water portions of this system.

Table 3.3.2.32: Neutron Monitoring System (092) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion and wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Fittings-RCPB	PB	Stainless Steel	Air/gas (internal)	None	None	IV.C1.1-i	None	G, 2
Fittings-RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-i	None	G, 2
Fittings-RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	H, 3
Fittings-RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings-RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One-Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note G Environment not in NUREG-1801 item for this component and material.

Note H	Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I	Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1	Wear is an aging mechanism that is only applicable to RCPB bolting. This is consistent with industry guidance.

2	There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3	The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.3.2.33: Traversing In-Core Probe System (094) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 1
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 1
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 1
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 1
Valves	PB	Stainless Steel	Air/gas (internal)	None	None	V.C.1-b	None	G, 1
Valves	PB	Stainless Steel	Inside Air (external)	None	None	V.E.1-b	None	F, 1

Table Notes:

Industry Standard Notes:

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Plant Specific Notes:

1 There are no applicable aging effects for this material/environment combination.

Table 3.3.2.34: Cranes System (111) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting & Fasteners	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to stress relaxation. Loss of material due to general corrosion.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	None	None	H, 1
Bolting & Fasteners	SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to stress relaxation.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	None	None	J, 1
Monorails	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.1-b	**3.3.1.16**	B
Monorails	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to mechanical wear.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.2-a	**3.3.1.16**	B
Rail/Rail Clips/Structural Girders	SS	Carbon and Low Alloy Steel	Inside Air (external)	Crack initiation/growth due to fatigue.	None	VII.B.1-a	**3.3.1.3**	A
Rail/Rail Clips/Structural Girders	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.1-b	**3.3.1.16**	B
Rail/Rail Clips/Structural Girders	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to mechanical wear.	Inspection of Overhead Heavy Load and Light Load Handling Systems Program (**B.2.1.20**)	VII.B.2-a	**3.3.1.16**	B

Table Notes:

Industry Standard Notes Used in this Table:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects identified for this material/environment combination are consistent with industry guidance.

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 systems identified in Section 2.3.4, Steam and Power Conversion 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:

Section	System No.	System Name
2.3.4.1	001	Main Steam
2.3.4.2	002	Condensate and Demineralized Water
2.3.4.3	003	Feedwater
2.3.4.4	006	Heater Drains and Vents
2.3.4.5	008	Turbine Drains and Miscellaneous Piping
2.3.4.6	027	Condenser Circulating Water
2.3.4.7	037	Gland Seal Water

A summary of the programs evaluated in NUREG-1801 for the Steam and Power Conversion Systems component groups that are relied on for license renewal are given in Table 3.4.1, Summary of Aging Management Evaluations in NUREG-1801 for Steam and Power Conversion Systems. This table uses the format described in Section 3.0. Table 3.4.1 only provides results for those items that are applicable to a BWR. NUREG-1800 provides basis for the further evaluation of the license renewal application to complete the summary of aging management evaluations in NUREG-1801 for plant specific considerations. When a further evaluation for Steam and Power Conversion Systems is recommended by the NUREG-1801, that further evaluation is identified in Table 3.4.1 and the evaluation in accordance with the NUREG-1800 basis is provided in Section 3.4.2.2.

3.4.2 Results

The following tables summarize the results of the aging management review for systems in the Steam and Power Conversion System group.

Table	System No.	System Name
3.4.2.1	001	Main Steam
3.4.2.2	002	Condensate and Demineralized Water
3.4.2.3	003	Feedwater
3.4.2.4	006	Heater Drains and Vents
3.4.2.5	008	Turbine Drains and Miscellaneous Piping
3.4.2.6	027	Condenser Circulating Water
3.4.2.7	037	Gland Seal Water

The materials from which the specific 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	System No.	System Name
3.4.2.1.1	001	Main Steam
3.4.2.1.2	002	Condensate and Demineralized Water
3.4.2.1.3	003	Feedwater
3.4.2.1.4	006	Heater Drains and Vents
3.4.2.1.5	008	Turbine Drains and Miscellaneous Piping
3.4.2.1.6	027	Condenser Circulating Water
3.4.2.1.7	037	Gland Seal Water

3.4.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

3.4.2.1.1 Main Steam System (001)

Materials

The materials of construction for the Main Steam (MS) System components are:

- Aluminum
- Carbon and low alloy steel
- Stainless steel

Environment

The MS System components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the MS System, require management:

- Crack initiation and growth due to stress corrosion cracking (SCC), fatigue, and cyclic loading
- Loss of bolting function due to wear
- Loss of material due to flow-accelerated, general, pitting, crevice, and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Main Steam System components.

- ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- BWR Stress Corrosion Cracking Program (**B.2.1.10**)
- Chemistry Control Program (**B.2.1.5**)
- Compressed Air Monitoring Program (**B.2.1.21**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.4.2.1.2 Condensate and Demineralized Water System (002)

Materials

The materials of construction for the Condensate and Demineralized Water System components are:

- Aluminum alloy
- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Polymer
- Stainless steel

Environment

The Condensate and Demineralized Water System components are exposed to the following environments:

- Air and Gas
- Inside air
- Outside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Condensate and Demineralized Water System require management:

- Crack initiation and growth due to stress corrosion cracking
- Loss of bolting function due to general corrosion
- Loss of material due to general, pitting, crevice, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Condensate and Demineralized Water System components:

- Aboveground Carbon Steel Tanks Program (**B.2.1.26**)
- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

3.4.2.1.3 Feedwater System (003)

Materials

The materials of construction for the Feedwater System components are:

- Carbon and low alloy steel
- Copper alloy
- Nickel alloy
- Stainless steel

Environment

The Feedwater components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Feedwater System require management:

- Change in material properties and reduction in fracture toughness due to thermal aging.
- Crack initiation and growth due to stress corrosion cracking, fatigue, and cyclic loading
- Loss of bolting function due to wear
- Loss of material due to flow-accelerated, general, pitting, galvanic, and crevice corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Feedwater System components:

- ASME Section XI Subsections IWB, IWC, AND IWD Inservice Inspection Program (**B.2.1.4**)
- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One-Time Inspection Program (**B.2.1.29**)

3.4.2.1.4 Heater Drains and Vents System (006) (F.1)

Materials

The materials of construction for the Heater Drains and Vents System components are:

- Carbon and low alloy steel

Environment

The Heater Drains and Vents components are exposed to the following environments:

- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects, associated with the Heater Drains and Vents System, require management:

- Loss of material due to flow-accelerated, general, pitting, crevice, and galvanic corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Heater Drains and Vents System components:

- Chemistry Control Program (**B.2.1.5**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One Time Inspection Program (**B.2.1.29**)

3.4.2.1.5 Turbine Drains and Miscellaneous Piping System (008) (F.1)

Materials

The materials of construction for the Turbine Drains and Miscellaneous Piping System components are:

- Carbon and low alloy steel

Environment

The Turbine Drains and Miscellaneous Piping components are exposed to the following environments:

- Treated water
- Inside air

Aging Effects Requiring Management

The following aging effects, associated with the Turbine Drains and Miscellaneous Piping System, require management:

- Loss of material due to flow-accelerated, general, pitting, and crevice corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Turbine Drains and Miscellaneous Piping System components.

- Chemistry Control Program (**B.2.1.5**)
- Flow-Accelerated Corrosion Program (**B.2.1.15**)
- One Time Inspection (**B.2.1.29**)

3.4.2.1.6 Condenser Circulating Water System (027)

Materials

The materials of construction for the Condenser Circulating Water System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Stainless steel

Environment

The Condenser Circulating Water components are exposed to the following environments:

- Air/gas
- Buried
- Embedded/enclosed
- Inside air
- Outside air
- Raw water

Aging Effects Requiring Management

The following aging effects, associated with the Condenser Circulating Water System, require management:

- Loss of bolting function due to general corrosion
- Loss of material due to biofouling, MIC, general, crevice, and pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for the Condenser Circulating Water System components:

- Bolting Integrity Program (**B.2.1.16**)
- Buried Piping and Tanks Inspection Program (**B.2.1.31**)
- One-Time Inspection Program (**B.2.1.29**)
- Systems Monitoring Program (**B.2.1.39**)

3.4.2.1.7 Gland Seal Water System (037)

Materials

The materials of construction for the Gland Seal Water System components are:

- Carbon and low alloy steel
- Cast iron and cast iron alloy
- Copper alloy
- Glass

Environment

The Gland Seal Water components are exposed to the following environments:

- Air/gas
- Inside air
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the Gland Seal Water System require management:

- Loss of material due to general, crevice, pitting, and galvanic corrosion
- Loss of material due to selective leaching of materials

Aging Management Programs

The following aging management programs manage the aging effects for the Gland Seal Water System components:

- Bolting Integrity Program (**B.2.1.16**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Selective Leaching of Materials Program (**B.2.1.30**)
- Systems Monitoring Program (**B.2.1.39**)

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 by the reviewer 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

Per NUREG-1800 paragraphs 3.4.2.2.1 and 3.4.3.2.1, 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 **4.3.3**.

3.4.2.2.2 Loss of Material due to General, Pitting, and Crevice Corrosion

BFN will implement the One Time Inspection Program (Section **B.2.1.29**) to verify the effectiveness of the Chemistry Control Program (Section **B.2.1.5**) at managing the loss of material due to general, pitting, and crevice corrosion.

3.4.2.2.3 Loss of Material due to General, Pitting, and Crevice Corrosion, Microbiologically Influenced Corrosion, and Biofouling

The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

3.4.2.2.4 General Corrosion

BFN will implement the System Monitoring Program (Section **B.2.1.39**) to manage general corrosion of external surfaces exposed to operating temperatures less than 212°F.

3.4.2.2.5 Loss of Material due to General, Pitting, Crevice, and Microbiologically Influenced Corrosion

1. The discussion in this paragraph of NUREG-1800 is applicable to PWRs only.

2. The discussion in this paragraph of NUREG-1800 is not applicable to BFN since the condensate storage tanks, and piping and fittings associated with the condensate storage tanks, at BFN are not located underground.

3.4.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

See Section **B.1.3** of this application for further discussion.

3.4.2.3 Time-Limited Aging Analysis

TLAAs identified for Steam and Power Conversion System include:

- Piping and Component Fatigue Analysis (Section **4.3.3**)

3.4.3 Conclusion

The Steam and Power Conversion Systems' piping, fittings, and 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**.

Descriptions of these aging management programs are 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 Steam and Power Conversion Systems' components will be adequately managed so that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.1	Piping and fittings in main feedwater line, steam line and in auxiliary feedwater (AFW) piping (PWR only)	Cumulative fatigue damage	TLAA, evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	See further evaluation in Section **3.4.2.2.1**. See discussion of TLAA in Section **4.3**.
3.4.1.2	Piping and fittings, valve bodies and bonnets, pump casings, tanks, tubes, tubesheets, channel head and shell (except main steam system)	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Water chemistry and one-time inspection	Yes, detection of aging effects is to be further evaluated	Consistent with NUREG-1801 with exceptions. See further evaluation in Section **3.4.2.2.2**. See discussion of AMP in Section **B.2.1.5**. and **B.2.1.29**
3.4.1.3	PWR only.				
3.4.1.4	PWR only.				
3.4.1.5	External surface of carbon steel components	Loss of material due to general corrosion	Plant specific	Yes, plant specific	See further evaluation in Section **3.4.2.2.4.** See description of AMP in Section **B.2.1.39**.
3.4.1.6	Carbon steel piping and valve bodies	Wall thinning due to flow-accelerated corrosion	Flow-accelerated corrosion	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.15**
3.4.1.7	Carbon steel piping and valve bodies in main steam system	Loss of material due to pitting and crevice corrosion	Water chemistry	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.5**
3.4.1.8	Closure bolting in high-pressure or high-temperature systems	Loss of material due to general corrosion; crack initiation and growth due to cyclic loading and/or SCC.	Bolting integrity	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.16.**

Table 3.4.1 Summary of Aging Management Evaluations 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
3.4.1.9	Heat exchangers and coolers/condensers serviced by open-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion, MIC, and biofouling; buildup of deposit due to biofouling	Open-cycle cooling water system	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.17**.
3.4.1.10	Heat exchangers and coolers/condensers serviced by closed-cycle cooling water	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Closed-cycle cooling water system	No	Consistent with NUREG-1801. See description of AMP in Section **B.2.1.18**.
3.4.1.11	External surface of aboveground condensate storage tank	Loss of material due to general (carbon steel only), pitting, and crevice corrosion	Aboveground carbon steel tanks	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section **B.2.1.26.**
3.4.1.12	External surface of buried condensate storage tank and AFW piping	Loss of material due to general, pitting, and crevice corrosion, and MIC	Buried piping and tanks surveillance or Buried piping and tanks inspection	No Yes, detection of aging effects and operating experience are to be further evaluated	Not applicable to BFN. The condensate storage tanks, and piping and fitting associated with the condensate storage tanks, at BFN are not located underground.
3.4.1.13	PWR only.				

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-a	None	I, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-b	None	I, 3
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	**3.4.1.7**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	H, 4
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	VIII.B2.1-b	**3.4.1.6**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VIII.B2.1-c	**3.4.1.1**	A
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	F, 4
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-a	None	G, 2
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	I, 4
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	H, 7
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-a	**3.1.1.25**	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-b	**3.1.1.1**	A
Fittings - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-a	None	F, 5, 8
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice corrosion, pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	F, 4, 8

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading, and SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B, 8
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	H, 4
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	**3.4.1.7**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	VIII.B2.1-b	**3.4.1.6**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VIII.B2.1-c	**3.4.1.1**	A
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	F, 4

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection (**B.2.1.29**)	IV.C1.1-a	None	G, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-a	None	G, 2
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	I, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-a	**3.1.1.25**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	H, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-b	**3.1.1.1**	A
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-a	None	F, 5
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	F, 4
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading and SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice (**F.1**)	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Restricting Orifice (**F.1**)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	H, 6
Restricting Orifice (**F.1**)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	**3.4.1.7**	D
Restricting Orifice (**F.1**)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	VIII.B2.1-b	**3.4.1.6**	C
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-a	None	F, 5
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-a	None	F, 4
Strainers (**F.1**)	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Strainers(**F.1**)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	**3.4.1.7**	D
Strainers (**F.1**)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic and general corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.B2.1-a	None	H, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Strainers (F.1)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.1-b	3.4.1.6	C
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	None	F, 4
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	Compressed Air Monitoring Program (B.2.1.21)	VIII.B2.1-a	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VIII.H.1-b	3.4.1.5	A
Valves (F.1)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII A.2-a	3.4.1.6	A, 7
Valves (F.1)	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII A.2-b	3.4.1.2	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.2-a	3.4.1.6	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.2-b	3.4.1.7	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic and general corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.2-b	None	H, 4
Valves	PB	Aluminum Alloy	Air/gas (internal)	None	None	VIII.B2.2-b	None	F, 4
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	VIII.H.1-b	None	F, 4
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 5
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.2-b	None	F, 4
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	IV.C1.3-a	None	G, 4
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 2
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	IV.C1.3-a	None	H, 6
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	IV.C1.3-a	3.1.1.25	A
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	3.1.1.1	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.1: Main Steam System (001) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	F, 5
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	BWR Stress Corrosion Cracking (**B.2.1.10**) Chemistry Control Program (**B.2.1.5**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	H, 6
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Table Notes:

Industry Standard Notes.

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Consistent with industry guidance, wear is an aging mechanism that is only assigned to RCPB bolting.

2 There are no applicable aging effects for this material/environment combination. Carbon and low alloy steels are not susceptible to external general corrosion when temperature is greater than 212 °F.

3 The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

6. The additional aging effects identified for this material/environment combination are consistent with industry guidance.

7. The only turbine valves within the scope of license renewal are the Unit 2 and 3 turbine stop valves.

8. This item includes carbon and low alloy steel pipe fittings and stainless steel pipe fittings and flow-limiting venturies. The intended function FR (flow restriction) is only applicable to the flow-limiting venturies.

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VIII.H.2-a	3.4.1.8	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VIII.H.2-a	3.4.1.8	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Outside Air (external)	None	None	VIII.H.2-b	None	I, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	None	None	VIII.H.2-a	None	F, 2
Bolting	MC, SS	Stainless Steel	Outside Air (external)	None	None	VIII.H.2-a	None	F, 2
Condenser (F.1)	PL	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	I, 3
Condenser (F.1)	PL	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	VIII E.4-a	None	I, 3
Condenser (F.1)	PL	Stainless Steel	Treated Water (internal)	None	None	VIII E.4-a	None	I, 3
Expansion Joint	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VIII.H.1-b	3.4.1.5	A
Expansion Joint	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.1-b	3.4.1.2	D, 4
Expansion Joint	PB	Stainless Steel	Outside Air (external)	None	None	VIII.H.1-b	None	F, 2
Expansion Joint	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	None	None	J, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Aluminum Alloy	Air/Gas (internal)	None	None	VIII.E.1-b	None	F, 2
Fittings	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VIII.H.1-b	**3.4.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VIII.H.1-b	**3.4.1.5**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	VIII.E.1-a	None	I, 5
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	**3.4.1.2**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	None	H, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VIII.H.1-b	None	F, 4
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	None	F, 4
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	VIII.E.1-b	None	F, 4

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.1-b	None	F, 4
Fittings	PB	Aluminum Alloy	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Fittings	PB	Aluminum Alloy	Outside Air (external)	None	None	VIII.H.1-b	None	F, 2
Fittings	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.1-b	None	F, 5
Fittings	PB	Polymer	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Fittings	PB	Polymer	Treated Water (internal)	None	None	VIII.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Air/Gas (internal)	None	None	VIII.E.1-b	None	F, 2
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Fittings	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.1-b	None	F, 4
Piping	PB	Aluminum	Air/Gas (internal)	None	None	VIII.E.1-b	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VIII.E.1-b	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VIII.H.1-b	3.4.1.5	A
Piping	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (B.2.1.39)	VIII.H.1-b	3.4.1.5	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	VIII.E.1-a	None	I, 5
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	**3.4.1.2**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	None	H, 4
Piping	PB	Aluminum Alloy	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Piping	PB	Aluminum Alloy	Outside Air (external)	None	None	VIII.H.1-b	None	F, 2
Piping	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice, galvanic, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	None	F, 4
Piping	PB	Stainless Steel	Air/Gas (internal)	None	None	VIII.E.1-b	None	F, 2
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Piping	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.1-b	None	F, 4
Pumps	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Pumps	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.3-a	None	F, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Restricting Orifice	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	None	None	J, 5
Tanks	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.E.5-a	None	G, 4
Tanks	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	Aboveground Carbon Steel Tanks Program (**B.2.1.26**)	VIII.E.5-c	**3.4.1.11**	A
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.E.5-a	**3.4.1.2**	B
Tubing	PB	Stainless Steel	Outside Air (external)	None	None	VIII.H.1-b	None	F, 2
Tubing	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Valves	PB	Aluminum Alloy	Air/Gas (internal)	None	None	VIII.E.2-b	None	F, 2
Valves	PB	Carbon and Low Alloy Steel	Air/Gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.E.2-b	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	Systems Monitoring Program (**B.2.1.39**)	VIII.H.1-b	**3.4.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	VIII.H.1-b	**3.4.1.5**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	VIII.E.2-a	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.2-b	3.4.1.2	B
Valves	PB	Cast Iron and Cast Iron Alloys	Air/Gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VIII.E.2-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VIII.H.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VIII.H.1-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VIII.E.2-b	None	F, 4
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.2-b	None	F, 4
Valves	PB	Aluminum Alloy	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Valves	PB	Aluminum Alloy	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.2-b	None	F, 4
Valves	PB	Copper Alloy	Air/Gas (internal)	None	None	VIII.E.2-b	None	F, 2
Valves	PB	Copper Alloy	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.2-b	None	F, 4

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.2: Condensate and Demineralized Water System (002) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	VIII.E.2-b	None	F, 4
Valves	PB	Stainless Steel	Air/Gas (internal)	None	None	VIII.E.2-b	None	F, 2
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 2
Valves	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.E.2-b	None	F, 4

Table Notes:

Industry Standard Notes.

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.

2 There are no applicable aging effects for this material/environment combination which is consistent with industry guidance.

3 The condenser housing is in the scope of license renewal for plateout of radioactive particles over a large surface area only. Therefore, aging affects do not require management.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 The portion of the Condensate and Demineralized Water System in-scope for license renewal is the condensate storage lines. The portion of the Condensate System that is within the license renewal boundary contains single phase fluid with temperatures < 200°F. Therefore, FAC is not a concern for the period of extended operation.

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-a	**3.4.1.8**	I, 2
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-b	None	I, 3
Bolting	MC, SS	Nickel Alloy	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Bolting	MC, SS	Stainless Steel	Inside Air (external)	Loss of bolting function due to wear.	Bolting Integrity Program (**B.2.1.16**)	None	None	J, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	G, 4
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	VIII.D2.1-a	**3.4.1.6**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	**3.4.1.2**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VIII.D2.1-c	**3.4.1.1**	A
Fittings	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	F, 5
Fittings	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	F, 4
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-c	None	G, 2
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-c	**3.1.1.25**	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-d	**3.1.1.1**	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-c	None	H, 5
Fittings - RCPB	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to cyclic loading and SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	G, 5
Fittings - RCPB	PB	Stainless Steel	Air/gas (internal) - moist air	Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	IV.C1.1-c	None	F, 5
Fittings - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-c	None	F, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	B
Fittings - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-c	None	F, 5
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	G, 4
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	VIII.D2.1-a	**3.4.1.6**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	**3.4.1.2**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	VIII.D2.1-c	**3.4.1.1**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	F, 5
Piping	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 6
Piping	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	F, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	None	G, 4
Piping - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	IV.C1.1-c	None	G, 5
Piping - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.1-c	None	G, 2
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.1-c	**3.1.1.25**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.1-d	**3.1.1.1**	A
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (**B.2.1.4**) One Time Inspection Program (**B.2.1.29**)	IV.C1.1-i	**3.1.1.7**	A

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	IV.C1.1-c	None	H, 5
Piping - RCPB	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to cyclic loading and SCC.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One Time Inspection Program (B.2.1.29)	IV.C1.1-i	None	G, 5
Piping - RCPB	PB	Stainless Steel	Air/gas (internal) - moist air	Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (B.2.1.29)	V.C1.1-c	None	F, 5
Piping - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.1-c	None	F, 6
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	B
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to cyclic loading.	ASME Section XI Subsections IWB, IWC and IWD Inservice Inspection Program (B.2.1.4) One Time Inspection Program (B.2.1.29)	IV.C1.1-i	3.1.1.7	A
Piping - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	IV.C1.1-c	None	F, 4
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (B.2.1.29)	None	None	J, 5
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Inside Air (external)	None	None	None	None	J, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Restricting Orifice - RCPB	FR, PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	None	None	J, 4
Tubing	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	F, 5
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 6
Tubing	PB	Stainless Steel	Treated Water (external)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.H.1-b	None	F, 5
Tubing	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.1-b	None	F, 4
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, galvanic, general, and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.2-b	None	G, 4
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	VIII.D2.2-a	**3.4.1.6**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.2-b	**3.4.1.2**	B
Valves	PB	Copper Alloys	Air/gas (internal)	None	None	VIII.D2.2-b	None	F, 6

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloys	Inside Air (external)	None	None	VIII.H.1-b	None	F, 6
Valves	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	VIII.D2.2-b	None	F, 5
Valves	PB	Stainless Steel	Inside Air (external)	None	None	VIII.H.1-b	None	F, 6
Valves	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC. Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	VIII.D2.2-b	None	F, 4
Valves - RCPB	PB	Carbon and Low Alloy Steel	Air/gas (internal) - moist air	Loss of material due to crevice, general, and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	IV.C1.3-a	None	G, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	IV.C1.3-a	None	G, 2
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.3-a	None	H, 5
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (**B.2.1.15**)	IV.C1.3-a	**3.1.1.25**	A
Valves - RCPB	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A
Valves - RCPB	PB	Stainless Steel - CASS	Air/gas (internal) - moist air	Change in material properties/reduction in fracture toughness due to thermal aging.	One Time Inspection Program (**B.2.1.29**)	IV.C1.3-b	None	G, 5
Valves - RCPB	PB	Stainless Steel	Air/gas (internal) - moist air	Crack initiation/growth due to SCC.	One Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	G, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.3: Feedwater System (003) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Valves - RCPB	PB	Stainless Steel	Air/gas (internal) - moist air	Loss of material due to crevice and pitting corrosion.	One Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	None	G, 5
Valves - RCPB	PB	Stainless Steel	Inside Air (external)	None	None	IV.C1.3-c	None	G, 6
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**))	IV.C1.3-c	None	H, 5
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to SCC.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	IV.C1.3-c	**3.1.1.29**	B
Valves - RCPB	PB	Stainless Steel	Treated Water (internal)	Crack initiation/growth due to fatigue.	None	IV.C1.3-d	**3.1.1.1**	A

Table Notes:

Industry Standard Notes.

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. Consistent with industry guidance, wear is an aging mechanism that is only assigned to RCPB bolting.
2. There are no aging effects for this material/environment combination. Carbon and low alloy steels are not susceptible to external general corrosion when temperature is greater than 212°F.
3. The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.
4. The aging effects identified for this material/environment combination are consistent with industry guidance.
5. The additional aging effects identified for this material/environment combination are consistent with industry guidance.
6. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.4.2.4: Heater Drains and Vents System (006) - Summary of Aging Management Evaluation (F.1)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H2-b	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H2-a	None	I, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	None	H, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	3.4.1.7	B, 3
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.1-b	3.4.1.6	A
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H1-b	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	3.4.1.7	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	None	H, 3
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.1-b	3.4.1.6	A

Table 3.4.2.4: Heater Drains and Vents System (006) - Summary of Aging Management Evaluation (F.1)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Traps	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	3.4.1.7	D
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.1-a	None	H, 3
Traps	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.1-b	3.4.1.6	C
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.2-a	3.4.1.6	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general and galvanic corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.2-b	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.2-b	3.4.1.7	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes.

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1. The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.
2. The aging effects identified for this material/environment combination are consistent with industry guidance. Carbon and low alloy steels are not susceptible to external general corrosion when piping temperature is greater than 212°F.
3. The aging effects identified for this material/environment combination are consistent with industry guidance

Table 3.4.2.5 Turbine Drains and Miscellaneous Piping System (008) - Summary of Aging Management Evaluation (F.1)

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-a	None	I, 1
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.2-b	None	I, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VIII.H.1-b	None	G, 1
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to flow-accelerated corrosion.	Flow-Accelerated Corrosion Program (B.2.1.15)	VIII.B2.2-a	3.4.1.6	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to general corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.D2.2-b	None	H, 3
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection Program (B.2.1.29)	VIII.B2.2-b	3.4.1.7	B

Table Notes:

Industry Standard Notes.

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Plant Specific Notes:

1 The aging effects identified for this material/environment combination are consistent with industry guidance. Carbon and low alloy steels are not susceptible to external general corrosion when temperature is greater than 212°F.

2 The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.

3 The aging effects identified for this material/environment combination are consistent with industry guidance.

Table 3.4.2.6: Condenser Circulating Water System (027) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (B.2.1.16)	VII.I.2-a	3.3.1.24	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	VII.I.2-b	None	I, 1
Fittings	PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	G, 2
Fittings	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB, SS	Carbon and Low Alloy Steel	Outside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Fittings	PB, SS	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	E
Fittings	PB, SS	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	G, 2
Fittings	PB, SS	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 2
Fittings	PB, SS	Stainless Steel	Air/gas (internal)	None	None	VII.C1.1-a	None	G, 3
Fittings	PB, SS	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Piping	PB, SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	G, 2
Piping	PB, SS	Carbon and Low Alloy Steel	Buried (external)	Loss of material due to MIC, crevice, general, and pitting corrosion.	Buried Piping and Tanks Inspection Program (B.2.1.31)	VII.I.1-b	None	G, 2
Piping	PB, SS	Carbon and Low Alloy Steel	Embedded/ Encased (external)	None	None	VII.I.1-b	None	G, 3
Piping	PB, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.6: Condenser Circulating Water System (027) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piping	SS	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion..	One Time Inspection Program (B.2.1.29)	VII.C1.1-a	None	E
Strainers	SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.6-a	None	G, 2
Strainers	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Strainers	SS	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.6-a	None	E
Tubing	PB	Stainless Steel	Air/gas (internal)	None	None	None	None	J, 3
Tubing	PB	Stainless Steel	Inside Air (external)	None	None	VII.I.1-b	None	F, 3
Valves	SS	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	G, 2
Valves	SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	3.3.1.5	A
Valves	SS	Carbon and Low Alloy Steel	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	E
Valves	SS	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	G, 2
Valves	SS	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (B.2.1.39)	VII.I.1-b	None	F, 2
Valves	SS	Cast Iron and Cast Iron Alloy	Raw Water (internal)	Loss of material due to biofouling, MIC, crevice, general, and pitting corrosion.	One Time Inspection Program (B.2.1.29)	VII.C1.2-a	None	F, 2
Valves	SS	Copper Alloys	Air/gas (internal)	None	None	VII.C1.2-a	None	G, 3
Valves	SS	Copper Alloys	Inside Air (external)	None	None	VII.I.1-b	None	F, 3

Table Notes:

Industry Standard Notes.

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801."

Note E Consistent with NUREG-1801 item for material, environment, and aging effect, a different aging management program is credited.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.4.2.7: Gland Seal Water System (037) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	Loss of bolting function due to general corrosion.	Bolting Integrity Program (**B.2.1.16**)	V.E.2-a	**3.2.1.18**	B
Bolting	MC, SS	Carbon and Low Alloy Steel	Inside Air (external)	None	None	V.E.2-b	None	I, 1
Fittings	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Fittings	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program(**B.2.1.29**)	V.C.1-a	None	H, 2
Fittings	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 2
Fittings	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 2
Fittings	PB	Glass	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Fittings	PB	Glass	Treated Water (internal)	None	None	V.C.1-a	None	F, 3

Table 3.4.2.7: Gland Seal Water System (037) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fittings	PB	Glass	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Fittings	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Fittings	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 2
Fittings	PB	Non-Ferrous	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program **(B.2.1.5)** One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 2
Piping	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Piping	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V C.1-a	**3.2.1.3, 3.2.1.5**	B
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to galvanic corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	H, 2
Piping	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Tanks	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Tanks	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.4.2.7: Gland Seal Water System (037) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Tanks	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	D
Tubing	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (B.2.1.30)	None	None	J, 2
Tubing	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	None	None	J, 2
Valves	PB	Carbon and Low Alloy Steel	Air/gas (internal)	Loss of material due to general corrosion.	One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	G, 2
Valves	PB	Carbon and Low Alloy Steel	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	**3.2.1.10**	A
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	**3.2.1.3, 3.2.1.5**	B
Valves	PB	Carbon and Low Alloy Steel	Treated Water (internal)	None	None	V.C.1-a	None	I, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Inside Air (external)	Loss of material due to general corrosion.	System Monitoring Program (**B.2.1.39**)	V.E.1-b	None	F, 3
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 2
Valves	PB	Cast Iron and Cast Iron Alloy	Treated Water (internal)	Loss of material due to crevice, general, and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 2

Table 3.4.2.7: Gland Seal Water System (037) - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Valves	PB	Copper Alloy	Air/gas (internal)	None	None	V.C.1-a	None	F, 3
Valves	PB	Copper Alloy	Inside Air (external)	None	None	V.E.1-b	None	F, 3
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to selective leaching.	Selective Leaching of Materials Program (**B.2.1.30**)	V.C.1-a	None	F, 2
Valves	PB	Copper Alloy	Treated Water (internal)	Loss of material due to crevice and pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection Program (**B.2.1.29**)	V.C.1-a	None	F, 2

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note H Aging effect not in NUREG-1801 item for this component, material and environment combination.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The bolting materials identified at BFN do not contain high strength bolting that is susceptible to cracking due to SCC. In addition, cracking due to high cycle fatigue is not considered a license renewal concern since it would be discovered and corrected during the current license period.

2 The aging effects identified for this material/environment combination are consistent with industry guidance.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3.5 AGING MANAGEMENT OF CONTAINMENTS, STRUCTURES, AND COMPONENT SUPPORTS

3.5.1 Introduction

This section provides the results of the aging management review for those structures identified in Section 2.4, Structures Scoping and Screening Results, as being subject to aging management review. The structures, or portions of structures, which are addressed in this section, are described in the indicated sections:

Section	Structure Name
2.4.1	**Boiling Water Reactor Containment Structures – NUREG-1801 Item II.B**
2.4.1.1	Primary Containment Structures
2.4.2	**Class 1 Group 2 Structures - NUREG-1801 Item III.A2**
2.4.2.1	Reactor Buildings
2.4.2.2	Equipment Access Lock
2.4.3	**Class 1 Group 3 Structures - NUREG-1801 Item III.A3**
2.4.3.1	Diesel Generator Buildings
2.4.3.2	Standby Gas Treatment Building
2.4.3.3	Off-Gas Treatment Building
2.4.3.4	Vacuum Pipe Building
2.4.3.5	Residual Heat Removal Service Water Tunnels
2.4.3.6	Electrical Cable Tunnel from Intake Pumping Station to the Powerhouse
2.4.3.7	Underground Concrete Encased Structures
2.4.3.8	Earth Berm
2.4.4	**Class 1 Group 6 Structures - NUREG-1801 Item III.A6**
2.4.4.1	Intake Pumping Station
2.4.4.2	Gate Structure No. 3
2.4.4.3	Intake Channel
2.4.4.4	North Bank of Cool Water Channel East of Gate Structure No. 2
2.4.4.5	South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3
2.4.5	**Class 1 Group 8 Structures - NUREG-1801 Item III.A8**
2.4.5.1	Condensate Water Storage Tanks’ Foundations and Trenches
2.4.5.2	Containment Atmosphere Dilution Storage Tanks’ Foundations

Section	Structure Name
2.4.6	**Class 1 Group 9 Structures - NUREG-1801 Item III.A9**
2.4.6.1	Reinforced Concrete Chimney
2.4.7	**Non-Class 1 Structures**
2.4.7.1	Turbine Buildings
2.4.7.2	Diesel High Pressure Fire Pump House
2.4.7.3	Vent Vaults
2.4.7.4	Transformer Yard
2.4.7.5	161 kV Switchyard
2.4.7.6	500 kV Switchyard
2.4.8	**Structures and Component Supports Commodities**
2.4.8.1	Structures and Component Supports Commodities Group

Table 3.5.1, Summary of Aging Management Evaluations 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 component groups that are relied on for license renewal. This table uses the format described in Section 3.0. Table 3.5.1 only provides results for those items that are applicable to a BWR. NUREG-1800 provides the basis for further evaluation of the license renewal application to complete the summary of aging management evaluations in NUREG-1801 for plant specific considerations. When a further evaluation for Structures is recommended by the NUREG-1801, that further evaluation is identified in Table 3.5.1 and the evaluation in accordance with the NUREG-1800 basis is provided in Section 3.5.2.2.

3.5.2 Results

The following tables summarize the results of the aging management review for structures.

Table	Structure Name
	Boiling Water Reactor Containment Structures – NUREG-1801 Item II.B
3.5.2.1	Primary Containment Structures
	Class 1 Group 2 Structures - NUREG-1801 Item III.A2
3.5.2.2	Reactor Buildings
3.5.2.3	Equipment Access Lock
	Class 1 Group 3 Structures - NUREG-1801 Item III.A3
3.5.2.4	Earth Berm
3.5.2.5	Diesel Generator Buildings
3.5.2.6	Standby Gas Treatment Building

Table	**Structure Name**
3.5.2.7	Off-Gas Treatment Building
3.5.2.8	Vacuum Pipe Building
3.5.2.9	Residual Heat Removal Service Water Tunnels
3.5.2.10	Electrical Cable Tunnel from Intake Pumping Station to the Powerhouse
3.5.2.11	Underground Concrete Encased Structures
	Class 1 Group 6 Structures - NUREG-1801 Item III.A6
3.5.2.12	Intake Pumping Station
3.5.2.13	Gate Structure No. 3
3.5.2.14	Intake Channel
3.5.2.15	North Bank of Cool Water Channel East of Gate Structure No. 2
3.5.2.16	South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3
	Class 1 Group 8 Structures - NUREG-1801 Item III.A8
3.5.2.17	Condensate Water Storage Tanks' Foundations and Trenches
3.5.2.18	Containment Atmosphere Dilution Storage Tanks' Foundations
	Class 1 Group 9 Structures - NUREG-1801 Item III.A9
3.5.2.19	Reinforced Concrete Chimney
	Non-Class 1 Structures
3.5.2.20	Turbine Buildings
3.5.2.21	Diesel High Pressure Fire Pump House
3.5.2.22	Vent Vaults
3.5.2.23	Transformer Yard
3.5.2.24	161 kV Switchyard
3.5.2.25	500 kV Switchyard
3.5.2.26	Structures and Component Supports

The materials from which the specific 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 Sections 3.5.2.1, Materials, Environment, Aging Effects Requiring Management and Aging Management Programs:

Section	Structure Name
	Boiling Water Reactor Containment Structures – NUREG-1801 Item II.B
3.5.2.1.1	Primary Containment Structures
	Class 1 Group 2 Structures - NUREG-1801 Item III.A2
3.5.2.1.2	Reactor Buildings
3.5.2.1.3	Equipment Access Lock
	Class 1 Group 3 Structures - NUREG-1801 Item III.A3
3.5.2.1.4	Earth Berm
3.5.2.1.5	Diesel Generator Buildings
3.5.2.1.6	Standby Gas Treatment Building
3.5.2.1.7	Off-Gas Treatment Building
3.5.2.1.8	Vacuum Pipe Building
3.5.2.1.9	Residual Heat Removal Service Water Tunnel
3.5.2.1.10	Electrical Cable Tunnel from Intake Pumping Station to the Powerhouse
3.5.2.1.11	Underground Concrete Encased Structures
	Class 1 Group 6 Structures - NUREG-1801 Item III.A6
3.5.2.1.12	Intake Pumping Station
3.5.2.1.13	Gate Structure No. 3
3.5.2.1.14	Intake Channel
3.5.2.1.15	North Bank of Cool Water Channel East of Gate Structure No. 2
3.5.2.1.16	South Dike of Cool Water Channel between Gate Structure Nos. 2 and 3
	Class 1 Group 8 Structures - NUREG-1801 Item III.A8
3.5.2.1.17	Condensate Water Storage Tanks' Foundations, and Trenches
3.5.2.1.18	Containment Atmosphere Dilution Storage Tanks' Foundations
	Class 1 Group 9 Structures - NUREG-1801 Item III.A9
3.5.2.1.19	Reinforced Concrete Chimney
	Non-Class 1 Structures
3.5.2.1.20	Turbine Buildings
3.5.2.1.21	Diesel High Pressure Fire Pump House

Section	Structure Name
3.5.2.1.22	Vent Vaults
3.5.2.1.23	Transformer Yard
3.5.2.1.24	161 kV Switchyard
3.5.2.1.25	500 kV Switchyard
3.5.2.1.26	Structures and Component Supports Commodities

3.5.2.1 Materials, Environment, Aging Effects Requiring Management and Aging Management Programs

3.5.2.1.1 Primary Containment Structures

Materials

The materials of construction for the Primary Containment Structure components are:

- Carbon and low alloy steel
- Elastomers
- Non-ferrous - copper alloys and lubrite
- Permali
- Reinforced concrete
- Stainless steel

Environment

The Primary Containment Structure components are exposed to the following environments:

- Containment atmosphere
- Embedded/encased
- Inside air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with the Primary Containment Structures require management:

- Crack initiation and growth due SCC
- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of leak tightness in closed position due to mechanical wear of locks, hinges and closure mechanisms
- Loss of material due general corrosion, crevice corrosion, pitting corrosion
- Loss of sealing and/or leakage through containment due to deterioration of seals, gaskets, and moisture barriers

Aging Management Programs

The following aging management programs manage the aging effects for the Primary Containment Structure components.

- 10 CFR 50 Appendix J Program (**B.2.1.34**)
- ASME Section XI Subsection IWE Program (**B.2.1.32**)
- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.2 Reactor Buildings

Materials

The materials of construction for Reactor Building components are:

- Boral
- Carbon and low alloy steel
- Ceramic fiber
- Elastomers
- Gypsum
- Masonry
- Non-ferrous - aluminum and copper alloys
- Reinforced concrete
- Roof Membrane (Insulation, flashing, sealants, and wood nailers)
- Stainless steel

Environment

Reactor Building components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside Air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with the Reactor Buildings require management:

- Crack initiation and growth due to SSC
- Cracking due to restraint, shrinkage, creep, aggressive environment
- Cracking due to vibration, loss of material due to abrasion, flaking
- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increased hardness, shrinkage due to weathering

- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to crevice corrosion, general corrosion
- Loss of material due to mechanical wear
- Loss of weatherproofing integrity due to cracking, drying, organic decomposition, separation, shrinkage, wear, weathering
- Reduction in neutron absorbing capacity, loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Reactor Building components.

- Chemistry Control Program (**B.2.1.5**)
- Fire Protection Program (**B.2.1.23**)
- Masonry Wall Program (**B.2.1.35**)
- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.3 Equipment Access Lock

Materials

The materials of construction for Equipment Access Lock components are:

- Carbon and low alloy steel
- Elastomers
- Non-ferrous - copper alloys
- Reinforced concrete
- Stainless steel

Environment

Equipment Access Lock components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Equipment Access Lock require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion
- Loss of material due to mechanical wear

Aging Management Programs

The following aging management programs manage the aging effects for Equipment Access Lock components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.4 Earth Berm

Materials

The materials of construction for Earth Berm structure components are:

- Rock and earthfill

Environment

Earth Berm structure components are exposed to the following environments:

- Buried
- Outside

Aging Effects Requiring Management

The following aging effects associated with the Earth Berm structure require management:

- Loss of material or loss of form due to erosion, settlement, sedimentation, frost action

Aging Management Programs

The following aging management programs manage the aging effects for Earth Berm structure components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.5 Diesel Generator Buildings

Materials

The materials of construction for Diesel Generator Building components are:

- Carbon and low alloy steel
- Ceramic fiber
- Elastomers
- Masonry
- Non-ferrous - aluminum and copper alloys
- Reinforced concrete
- Stainless Steel

Environment

Diesel Generator Building components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Diesel Generator Buildings require management:

- Cracking due to restraint, shrinkage, creep, aggressive environment
- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increased hardness, shrinkage due to weathering
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion
- Loss of material due to mechanical wear

Aging Management Programs

The following aging management programs manage the aging effects for Diesel Generator Building components.

- Fire Protection Program (**B.2.1.23**)
- Masonry Wall Program (**B.2.1.35**)
- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.6 Standby Gas Treatment Building

Materials

The materials of construction for Standby Gas Treatment (SGT) Building components are:

- Carbon and low alloy steel
- Reinforced concrete

Environment

SGT Building components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the SGT Building require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion

Aging Management Programs

The following aging management program manages the aging effects for SGT Building components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.7 Off-Gas Treatment Building

Materials

The materials of construction for Off-Gas Treatment Building components are:

- Carbon and low alloy steel
- Elastomers
- Reinforced concrete

Environment

Off-Gas Treatment Building components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Off-Gas Treatment Building require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increase in porosity and permeability, loss of strength due leaching of calcium hydroxide
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Off-Gas Treatment Building components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.8 Vacuum Pipe Building

Materials

The materials of construction for Vacuum Pipe Building components are:

- Carbon and low alloy steel
- Reinforced concrete

Environment

Vacuum Pipe Building components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Vacuum Pipe Building require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, loss of strength due to calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Vacuum Pipe Building components:

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.9 Residual Heat Removal Service Water Tunnel

Materials

The materials of construction for Residual Heat Removal Service Water (RHRSW) Tunnel components are:

- Carbon and low alloy steel
- Elastomers
- Reinforced concrete

Environment

RHRSW Tunnel components are exposed to the following environments:

- Buried
- Embedded/encased
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the RHRSW Tunnel require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for RHRSW Tunnel components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.10 Electrical Cable Tunnel from the Intake Pumping Station to the Powerhouse

Materials

The materials of construction for Electrical Cable Tunnel, from the Intake Pumping Station to the Powerhouse, components are:

- Carbon and low alloy steel
- Non-ferrous - aluminum
- Reinforced concrete

Environment

Electrical Cable Tunnel, from the Intake Pumping Station to the Powerhouse, components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air

Aging Effects Requiring Management

The following aging effects associated with the Electrical Cable Tunnel, from the Intake Pumping Station to the Powerhouse, require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material due to general corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Electrical Cable Tunnel, from the Intake Pumping Station to the Powerhouse, components:

- Fire Protection Program (**B.2.1.23**)
- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.11 Underground Concrete Encased Structures

Materials

The materials of construction for Underground Concrete Encased Structure components are:

- Carbon and low alloy steel
- Elastomers
- Reinforced concrete

Environment

Underground Concrete Encased Structure components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Underground Concrete Encased Structures require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Underground Concrete Encased Structures components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.12 Intake Pumping Station

Materials

The materials of construction for Intake Pumping Station components are:

- Carbon and low alloy steel
- Elastomers
- Masonry block
- Non ferrous - aluminum and copper alloys
- Reinforced concrete
- Stainless steel
- Thermolag

Environment

Intake Pumping Station components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with the Intake Pumping Station require management:

- Cracking due to restraint, shrinkage, creep, aggressive environment
- Cracking due to vibration, loss of material due to abrasion
- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Hardening, loss of strength due to elastomer degradation
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion
- Loss of material due to mechanical wear

Aging Management Programs

The following aging management programs manage the aging effects for Intake Pumping Station components.

- Fire Protection Program (**B.2.1.23**)
- Inspection of Water-Control Structures Program (**B.2.1.37**)
- Masonry Wall Program (**B.2.1.35**)

3.5.2.1.13 Gate Structure No. 3

Materials

The materials of construction for Gate Structure No. 3 components are:

- Carbon and low alloy steel
- Reinforced concrete

Environment

Gate Structure No. 3 components are exposed to the following environments:

- Buried
- Embedded/encased
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects, associated with Gate Structure No. 3, require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide or aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Gate Structure No. 3 components.

- Inspection of Water-Control Structures Program (**B.2.1.37**)

3.5.2.1.14 Intake Channel

Materials

The materials of construction for Intake Channel components are:

- Earthfill (clay and in-situ soil)

Environment

Intake Channel components are exposed to the following environments:

- Buried
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects, associated with the Intake Channel, require management:

- Loss of material, loss of form due to erosion, sedimentation, frost action, seepage

Aging Management Programs

The following aging management programs manage the aging effects for Intake Channel components.

- Inspection of Water-Control Structures Program (**B.2.1.37**)

3.5.2.1.15 North Bank of Cool Water Channel East of Gate Structure No. 2

Materials

The materials of construction for North Bank of Cool Water Channel East of Gate Structure No. 2 components are:

- Earthfill (clay and in-situ soil)

Environment

North Bank of Cool Water Channel East of Gate Structure No. 2 components are exposed to the following environments:

- Buried
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with the North Bank of Cool Water Channel East of Gate Structure No. 2 require management:

- Loss of material, loss of form due to erosion, sedimentation, frost action, seepage

Aging Management Programs

The following aging management programs manage the aging effects for North Bank of Cool Water Channel East of Gate Structure No. 2 components.

- Inspection of Water-Control Structures Program (**B.2.1.37**)

3.5.2.1.16 South Dike of the Cool Water Channel between Gate Structure Nos. 2 and 3

Materials

The materials of construction for South Dike of the Cool Water Channel between Gate Structure No. 2 and 3 components are:

- Earthfill (clay and in-situ soil)

Environment

South Dike of the Cool Water Channel between Gate Structure Nos. 2 and 3 components are exposed to the following environments:

- Buried
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with the South Dike of the Cool Water Channel between Gate Structures Nos. 2 and 3 require management:

- Loss of material, loss of form due to erosion, sedimentation, frost action, seepage

Aging Management Programs

The following aging management programs manage the aging effects for South Dike of the Cool Water Channel between Gate Structure Nos. 2 and 3 components.

- Inspection of Water-Control Structures Program (**B.2.1.37**)

3.5.2.1.17 Condensate Water Storage Tanks' Foundations and Trenches

Materials

The materials of construction for Condensate Water Storage Tanks' Foundation and Trench components are:

- Carbon and low alloy steel
- Earthfill (rock and sand)
- Reinforced concrete

Environment

Condensate Water Storage Tanks' Foundation and Trench components are exposed to the following environments:

- Buried
- Embedded/encased
- Outside Air

Aging Effects Requiring Management

The following aging effects associated with the Condensate Water Storage Tanks' Foundations and Trenches require management:

- Cracking, loss of bond, loss of material (spalling,scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Condensate Water Storage Tanks' Foundation and Trench components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.18 Containment Atmosphere Dilution Storage Tanks' Foundations

Materials

The materials of construction for Containment Atmosphere Dilution (CAD) Storage Tanks' Foundation components are:

- Reinforced concrete

Environment

CAD Storage Tanks' Foundation components are exposed to the following environments:

- Buried
- Outside Air

Aging Effects Requiring Management

The following aging effects associated with the CAD Storage Tanks' Foundations require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw

Aging Management Programs

The following aging management programs manage the aging effects for CAD Storage Tanks' Foundations components:

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.19 Reinforced Concrete Chimney

Materials

The materials of construction for Reinforced Concrete Chimney components are:

- Carbon and low alloy steel
- Reinforced concrete
- Roof Membrane (Insulation, flashing, sealant, and wood nailers)

Environment

Reinforced Concrete Chimney components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Reinforced Concrete Chimney require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion
- Loss of weatherproofing integrity due to wear, weathering, organic decomposition, separation, shrinkage, cracking, drying

Aging Management Programs

The following aging management programs manage the aging effects for Reinforced Concrete Chimney components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.20 Turbine Buildings

Materials

The materials of construction for Turbine Building components are:

- Carbon and low alloy steel
- Masonry*
- Reinforced concrete
- Roof Membrane (Insulation, flashing, sealants and wood nailers)

* Masonry is a material type identified for Unit 2 only. Masonry/Masonry Walls are not in scope for Units 1 and 3 for the period of extended operation.

Environment

Turbine Building components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Turbine Buildings require management:

- Cracking due to restraint, shrinkage, creep, aggressive environment
- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion
- Loss of weatherproofing integrity due to shrinkage, cracking, drying, separation, organic decomposition, wear, weathering

Aging Management Programs

The following aging management programs manage the aging effects for Turbine Building components.

- Masonry Wall Program (**B.2.1.35**)
- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.21 Diesel High Pressure Fire Pump House

Materials

The materials of construction for Diesel High Pressure Fire Pump House components are:

- Carbon and low alloy steel
- Reinforced concrete
- Roof Membrane (Insulation, flashing, sealants, and wood nailers)
- Stainless Steel

Environment

Diesel High Pressure Fire Pump House components are exposed to the following environments:

- Buried
- Embedded/encased
- Inside air
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with the Diesel High Pressure Fire Pump House require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material (spalling, scaling) and cracking due to freeze-thaw
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion
- Loss of weatherproofing integrity due to wear, weathering, organic decomposition, separation, shrinkage, cracking, drying

Aging Management Programs

The following aging management programs manage the aging effects for Diesel High Pressure Fire Pump House components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.22 Vent Vaults

Materials

The materials of construction for Vent Vault components are:

- Reinforced concrete

Environment

Vent Vault components are exposed to the following environments:

- Buried
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Vent Vaults require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide
- Loss of material (spalling, scaling) and cracking due to freeze-thaw

Aging Management Programs

The following aging management programs manage the aging effects for Vent Vault components:

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.23 Transformer Yard

Materials

The materials of construction for Transformer Yard components are:

- Carbon and low alloy steel

Environment

Transformer Yard components are exposed to the following environments:

- Buried
- Embedded/encased
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the Transformer Yard require management:

- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for Transformer Yard components.

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.24 161 kV Switchyard

Materials

The materials of construction for the 161 kV Switchyard components are:

- Carbon and low alloy steel
- Reinforced concrete

Environment

161 kV Switchyard components are exposed to the following environments:

- Buried
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with the 161 kV Switchyard require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracks, distortion, increase in component stress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for 161 kV Switchyard components:

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.25 500 kV Switchyard

Materials

The materials of construction for 500 kV Switchyard components are:

- Carbon and low alloy steel
- Reinforced concrete

Environment

500 kV Switchyard components are exposed to the following environments:

- Buried
- Inside air
- Outside air

Aging Effects Requiring Management

The following aging effects associated with 500 kV Switchyard components require management:

- Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel
- Cracking, distortion, increase in componentstress level due to settlement
- Expansion and cracking due to reaction with aggregates
- Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack
- Loss of material due to general corrosion, crevice corrosion, pitting corrosion

Aging Management Programs

The following aging management programs manage the aging effects for 500 kV Switchyard components:

- Structures Monitoring Program (**B.2.1.36**)

3.5.2.1.26 Structures and Component Supports Commodities

Materials

The materials of construction for Structures and Component Supports Commodities are:

- Carbon and low alloy steel
- Cast iron
- Non Ferrous - aluminum and lubrite
- Reinforced concrete
- Stainless steel

Environment

Structures and Component Supports Commodities are exposed to the following environments:

- Buried
- Containment atmosphere
- Embedded/encased
- Inside air
- Outside air
- Submerged

Aging Effects Requiring Management

The following aging effects associated with Structures and Component Supports Commodities require management:

- Loss of material due to microbiologically influenced corrosion (MIC), general corrosion, crevice corrosion, pitting corrosion
- Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads
- Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.

Aging Management Programs

The following aging management programs manage the aging effects for Structures and Component Supports Commodities:

- ASME Section XI, Subsection IWF Program (**B.2.3.33**)
- Chemistry Control Program (**B.2.1.5**)
- One-Time Inspection Program (**B.2.1.29**)
- Structures Monitoring Program (**B.2.1.36**)

3.5.2.2 Further Evaluation of Aging Management as Recommended By NUREG-1801

NUREG-1801 provides the basis for identifying those activities that warrant further evaluation by the reviewer in the license renewal application. For structures, those programs are addressed in the following sections.

3.5.2.2.1 Pressurized Water Reactor and Boiling Water Reactor Containments

3.5.2.2.1.1 Aging of Inaccessible Concrete Areas

This discussion in this paragraph of NUREG-1800 is not applicable to BFN since BFN is a BWR with a Mark I containment.

3.5.2.2.1.2 Cracking, Distortion, and Increase in Component Stress Level due to Settlement; Reduction of Foundation Strength due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program

This discussion in this paragraph of NUREG-1800 is not applicable to BFN since BFN is a BWR with a Mark I containment.

3.5.2.2.1.3 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

This discussion in this paragraph of NUREG-1800 is not applicable to BFN since BFN is a BWR with a Mark I containment.

3.5.2.2.1.4 Loss of Material due to Corrosion in Inaccessible Areas of Steel Containment Shell or Liner Plate

Loss of material due to corrosion in inaccessible areas of steel containment elements is not significant. The drywell steel containment vessel is inaccessible (except for the drywell head) for visual examination from the outside surface. There has been evidence of water leaking from the sand bed drains on both Units 2 and 3. Since there is a horizontal weld connecting the first and second course of drywell liner plates approximately 8 inches above the drywell concrete floor, UT thickness measurements from the drywell floor up to this weld, around the drywell circumference, would conservatively bound the sand pocket area. UT thickness measurements of this area were obtained during the U2C10 and U3C8 refueling outages for Units 2 and 3 respectively and in 1999 and 2002 for Unit 1. The data indicated that the condition of the drywell steel liner plate in this area is good and that this area did not require augmented examination.

BFN concrete structures and concrete components are designed in accordance with ACI 318-63 and ACI 318-71 and constructed using materials conforming to ACI and ASTM standards. The Structures Monitoring Program (**B.2.1.36**) monitors the concrete to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell. Research of plant history did not reveal any instances of borated water spills or water ponding on the containment concrete floor. A general visual inspection of the moisture barrier at the junction of the steel drywell shell and the concrete floor is performed once each inspection interval in accordance with the ASME Section XI, Subsection IWE (**B.2.1.32**) aging management program.

Therefore, since all of the NUREG-1801 further evaluation conditions are satisfied, a plant-specific aging management program for corrosion in inaccessible areas (embedded containment steel shell and drywell support skirt) is not required.

3.5.2.2.1.5 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

This discussion in this paragraph of NUREG-1800 is not applicable to BFN since BFN is a BWR with a Mark I containment.

3.5.2.2.1.6 Cumulative Fatigue Damage

NUREG-1800 paragraph 3.5.2.2.1.6 provides a recommendation for Further Evaluation of cumulative fatigue damage as a TLAA. Fatigue Analysis of BWR Mark I and Mark II containment steel elements, penetration sleeves, and penetration bellows are TLAAs as defined in 10 CFR 54.3. Browns Ferry Units 1, 2, and 3 are steel Mark I Containments. Cumulative fatigue damage of Mark I Containments steel elements, penetration sleeves, and penetration bellows are required to be evaluated in accordance with 10 CFR 54.21(c). The TLAA evaluation of cumulative fatigue damage is addressed in Section **4.6**.

3.5.2.2.1.7 Cracking due to Cyclic Loading and Stress Corrosion Cracking

Stress corrosion cracking of stainless steels exposed to atmospheric conditions and contaminants is considered plausible only if the material temperature is above 140^{o}F. In general, SCC very rarely occurs in austenitic stainless steels below 140^{o}F. Although stress corrosion cracking has been observed in systems at lower temperatures than this 140^{o}F threshold, all of these instances have identified a significant presence of contaminants (halogens, specifically chlorides) in the failed components. The material is at a relatively low temperature, in a sheltered environment, and not exposed to a corrosive environment.

Industry experience, denoted in NRC IN 92-20, described instances of the failure of the 10 CFR 50 Appendix J LLRT test to detect cracking in stainless steel containment penetration bellows. The LLRT test was inadequate due to the type of penetration bellows utilized at the Quad Cities Station Unit 1. The type of bellows used on the BFN containment penetrations are not the type described in NRC IN 92-20 (Quad Cities Station Unit 1). The vent line bellows at BFN are a single ply bellow design. Pipe penetration bellows for high energy lines are two ply bellows with a mesh. The design of the BFN penetration bellows allows full pressure to be transmitted to all portions of the bellows during Appendix J testing. The BFN containment penetrations bellows are not susceptible to a failure of the 10 CFR 50 Appendix J LLRT test to detect cracking, as described in NRC IN 92-20. A review of the operating history for the past five years for BFN did not indicate any failures associated with vent line and penetration bellows.

The reinstatement of Examination Categories E-B and E-F would result in hardship or unusual difficulty for TVA without a compensating increase in the level of quality and safety. Therefore, existing requirements for 10 CFR 50 Appendix J leak rate testing (**B.2.1.34**) and visual examinations, in accordance with ASME Section XI, Subsection IWE, Examination Category E-A, should be adequate to detect cracking due to stress corrosion cracking and the reinstatement of ASME Section XI, Subsection IWE, Weld Examination Categories E-B and E-F would not be required. Weld Examination Categories E-B and E-F have been removed from the ASME Section XI, 1998 edition.

3.5.2.2.2 Class 1 Structures

3.5.2.2.2.1 Aging of Structures Not Covered by Structures Monitoring Program

These further evaluations are also applied to Group 6 structures when applicable. Technical details of the aging management reviews associated with NUREG-1800, Section 3.5.2.2.1.2 (Cracking, Distortion, and Increase in Components Stress Level due to Settlement; Reduction of Foundation Strength due to Erosion of Porous Concrete Subfoundations, if Not Covered by Structures Monitoring Program) and Section 3.5.2.2.1.3 (Reduction of Strength and Modulus of Elasticity due to Elevated Temperature) are incorporated in this further evaluation.

1. <u>Scaling, cracking, and spalling due to repeated freeze-thaw for Groups 1-3, 5, 7-9 structures</u>

   Browns Ferry is located in an area with moderate weathering conditions as noted on Figure 1 of ASTM C33-99. Freeze-thaw is not considered an aging mechanism for concrete components below the frost line. The BFN concrete structures and concrete are designed in accordance with ACI 318-63 and ACI 318-71 and constructed using ingredients conforming to ACI and ASTM standards. TVA specifications require all concrete to contain an air-entraining agent in sufficient quantity to maintain specified percentages based on nominal maximum size aggregate. For severe weather exposures (as defined in TVA-Specifications), the air content identified varies from 4 to 10 percent depending on aggregate size. Severe weather exposure (as described in TVA-Specifications), is defined as “all exterior surfaces of concrete which will be exposed to alternate wetting and drying.”

The TVA specified air content for reinforced concrete is greater than the 3 to 6 percent for air content identified in ISG-03. Therefore loss of material (spalling, scaling) and cracking due to freeze-thaw are aging effects that require aging management in accordance with ISG –03 for below grade (above the frost line) reinforced concrete structures and components. Below grade (above the frost line) reinforced concrete will be inspected by the Structures Monitoring Program (**B.2.1.36**) when excavated for any reason. Accessible exterior above grade concrete will be monitored by the Structures Monitoring Program (**B.2.1.36**) to manage loss of material and cracking due to freeze-thaw.

2. Scaling, cracking, spalling and increase in porosity and permeability due to leaching of calcium hydroxide and aggressive chemical attack for Groups 1-5, 7-9 structures

BFN concrete structures and concrete components are designed in accordance with ACI 318-63 and ACI 318-71 and constructed using ingredients conforming to ACI and ASTM standards, which provide for a good quality, dense, well cured, and low permeability concrete. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and concrete components are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development, and achievement of a water-to-cement ratio which is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. In addition, concrete components must be exposed to flowing water through the concrete component. Leaching of calcium hydroxide is readily noticeable as white deposits that remain on the concrete surface after a solution of water-free lime from the concrete and carbon dioxide from the air is absorbed and dries. The Structures Monitoring Program (**B.2.1.36**) inspects concrete areas for signs of leaching. No significant signs of leaching have been documented during these inspection walkdowns. Therefore, the conditions identified in NUREG-1801 as revised by ISG-03 are satisfied and aging management of an increase in porosity and permeability and a loss of strength due to leaching of calcium hydroxide for below grade inaccessible concrete is not required. However, BFN will use the Structures Monitoring Program (**B.2.1.36**) to manage aging effects caused by an increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide of concrete.

BFN will use the Structures Monitoring Program (**B.2.1.36**) to inspect accessible concrete areas for aging effects caused by scaling, cracking, spalling and increase in porosity and permeability due to aggressive chemical attack.

3. Expansion and cracking due to reaction with aggregates for Groups 1-5, 7-9 structures

The aggregate used in the concrete of the BFN components did not come from a region known to yield aggregates suspected of or known to cause aggregate reactions. Materials for concrete used in BFN structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. All aggregates used at BFN conform to the requirements of ASTM C33 "Standard Specification of Concrete Aggregates." Appendix XI of ASTM C33 identifies methods for evaluating potential reactivity of aggregates including ASTM C295, ASTM C289, ASTM C227, and ASTM C342. If potentially reactive aggregates were used, then use of a low alkali Portland Cement (ASTM C150 Type II) containing less than 0.60 percent alkali calculated as sodium oxide equivalent was required by TVA Specification and will prevent harmful expansion due to alkali aggregate reaction. Therefore, the conditions identified in NUREG-1801 as revised by ISG-03 are satisfied and aging management of expansion and cracking due to reaction with aggregates for below grade inaccessible concrete is not required. However, BFN will use the Structures Monitoring Program (**B.2.1.36**) to inspect accessible concrete areas for aging effects caused by reaction with aggregates.

4. Cracking, spalling, loss of bond, and loss of material due to corrosion of embedded steel for Groups 1-5, 7-9 structures

   BFN will use the Structures Monitoring Program (**B.2.1.36**) to inspect accessible concrete areas for aging effects caused by corrosion of embedded steel.

5. Cracks, distortion, and increase in component stress level due to settlement for Groups 1-3, 5, 7-9 structures

   Cracks, distortion, increase in component stress level due to settlement are not considered as aging effects requiring management for BFN structures founded on rock or bearing piles. The following BFN structures are founded on rock or bearing piles: Reactor Buildings, Primary Containments, Intake Pumping Station, Reinforced Concrete Chimney, Off-Gas Treatment Building, Equipment Access Lock, Turbine Buildings, Gate Structure Number 3, Diesel HPFP House, Transformer Yard, and RHRSW Tunnel. Based on industry experience, settlement of Class 1 structures founded on bedrock or bearing piles have not been noted to cause aging effects requiring management.

   For concrete structures founded on dense soil or backfill; if in the past 20 years of operating experience for a structure, the total differential settlement experienced are well within the permissible limits for this type of structure and no settlement has manifested itself via cracked walls or cracked foundations, then it can be concluded that cracking due to settlement is not significant, and would not be applicable for the structure during the period of extended operation. Prior settlement monitoring programs at BFN have revealed that soil settlement has stabilized and the structures will continue to perform their intended functions. However, due to prior operating history of settlement in the 1980's at BFN, cracking and distortion due to settlement for BFN structures founded on soil or backfill will be monitored by the Structures Monitoring program (**B.2.1.36**).

6. Reduction of foundation strength due to erosion of porous concrete subfoundation for Groups 1-3, 5-9 structures

   The BFN evaluation of Information Notice 98-26 concluded that porous concrete subfoundations were not used at BFN. A de-watering system is not relied upon for control of erosion of cement from porous concrete subfoundations. Therefore, reduction in foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundation are not applicable to BFN.

7. Loss of material due to corrosion of structural steel components for Groups 1-5, 7-8 structures

   The BFN Structures Monitoring program (**B.2.1.36**) will manage loss of material due to corrosion of structural steel components. The Structures Monitoring Program procedures specify visual inspections of structural conditions as the method used to detect degradation.

   For the steel that is embedded/encased within the concrete, corrosion is not an applicable aging mechanism. The concrete must first be degraded by other aging mechanisms, which reduce the protective cover and allow for the intrusion of aggressive ions causing a reduction in concrete pH. Aging management of previously noted concrete aging effects will manage loss of material for steel that is embedded/encased within concrete.

   NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. Loss of material for steel piles driven in undisturbed or disturbed soil does not require aging management.

   The protective coating monitoring and maintenance program is not credited for aging management of loss of material for structural steel components.

8. Loss of strength and modulus of concrete structures due to elevated temperatures for Groups 1-5

   With the exception of the main steam tunnels in the Reactor Building, BFN reinforced concrete structures have general area temperatures less than 150ºF during normal operation. General area temperatures have been conservatively evaluated using maximum normal space ambient temperatures noted on the Harsh Environmental drawing series and associated calculations. The main steam tunnels at BFN Units 1, 2, and 3 have a maximum normal space ambient temperature of 160ºF as noted in the Harsh Environmental drawing series and associated calculations. Note: This is a maximum normal space ambient temperature. The TVA Harsh Environmental drawing series and associated calculations identify the space average normal ambient temperature as 135ºF. This is judged to be acceptable because when concrete is subjected to prolonged exposure to elevated temperatures, reductions in excess of 10 percent of the compressive strength, tensile strength, and the modulus of elasticity begin to occur in the range of 180ºF to 200ºF.

   Each BFN drywell is cooled during normal plant operation by a closed loop ventilation system designed to hold average temperature in the drywell to <150ºF. The general area temperature inside the drywell (primary containment) is maintained below 150°F as required by Technical Specifications. Elevated temperature on internal concrete components such as the reactor support pedestal, where the temperature could approach 150°F, are addressed as appropriate by BFN Civil Design Criteria. The drywell concrete structure surrounding the drywell vessel was evaluated for thermal effects from the general area temperature of the drywell. The upper elevations of the sacrificial shield wall may exceed 150ºF briefly and infrequently, during abnormal operations and is not considered to affect its function.

Therefore the conditions identified in NUREG-1801 are satisfied and aging management of reduction of strength and modulus due to elevated temperature for concrete components at BFN is not required.

9. Crack initiation and growth due to SCC and loss of material due to crevice corrosion of stainless steel liner for Groups 7 and 8 structures

   BFN does not have any Group 7 structures. BFN does not have in-scope stainless steel liners in an exposed-to-fluid environment for any Group 8 structures.

3.5.2.2.2.2 Aging Management of Inaccessible Areas

Design and construction of BFN reinforced concrete provides for dense, well cured, and low permeability concrete that provides acceptable degree of protection against exposure of the embedded steel to an aggressive environment. Cracking of concrete is controlled through proper arrangement and distribution of reinforcing steel.

Continued or frequent cyclic exposure to the following aggressive environments is necessary for aggressive chemicals to cause significant aggressive chemical attack or corrosion of embedded steel:

- Acidic solutions with pH < 5.5
- Chloride solutions >500 ppm
- Sulfate solutions >1500 ppm

Since aggressive chemicals are contained at plant sites, system leakage is possible that could cause aggressive chemical attack. However, leaks are not expected to continue for the extensive periods required for degradation, and repairs would be completed prior to loss of intended function. An aggressive environment may also occur where concrete is exposed to aggressive aqueous solutions such as groundwater or aggressive water flow. BFN groundwater water sample measurements confirm that parameters are below threshold limits that could cause aggressive chemical attack for below grade inaccessible concrete. Natural groundwater movement in this area is from the plant site to the Wheeler Reservoir. Wheeler Reservoir water samples also confirm an aggressive environment does not exist. Therefore, the conditions identified in NUREG-1801 as revised by ISG-03 are satisfied and aging management of increase in cracking, spalling, and increases in porosity and permeability, due to aggressive chemical attack and cracking, spalling, loss of bond and loss of material due to corrosion of embedded steel for below grade inaccessible concrete is not required.

3.5.2.2.3 Component Supports

3.5.2.2.3.1 Aging of Supports Not Covered by Structures Monitoring Program

Reduction in concrete anchor capacity due to degradation of the surrounding concrete, for Groups B1-B5 supports – Reduction in concrete anchor capacity due to local concrete degradation for Groups B1 –B5 supports will be managed by the structures monitoring program (**B.2.1.36**).

Loss of material due to environmental corrosion for Groups B2-B5 supports – Loss of material due to environmental corrosion for Groups B2 – B5 Supports will be managed by the structures monitoring program (**B.2.1.36**).

Reduction/loss of isolation function due to degradation of vibration isolation elements, for Group B4 supports – There are no vibration elements in the scope of license renewal at BFN.

3.5.2.2.3.2 Cumulative Fatigue Damage due to Cyclic Loading

NUREG-1800 paragraph 3.5.2.2.3.2 provides a recommendation for Further Evaluation of cumulative fatigue damage of component supports as a TLAA. Fatigue of component support members, anchor bolts, and welds for Group B1.1, B1.2, and B1.3 component supports is a TLAA as defined in 10 CFR 54.3 only if a CLB fatigue analysis exists. BFN piping and component supports were designed to ANSI USAS B31.1-1967. ANSI USAS B.31.1-1967 does not require fatigue analysis of supports or design of supports for fatigue effects. Some ASME Class MC support components were the subject of fatigue analysis in support of the Mark I “new loads” program. Cumulative fatigue damage of ASME III Class MC support components were required to be evaluated in accordance with 10 CFR 54.21 (c)(1). The TLAA evaluation of ASME Class MC support components is addressed in Section **4.6**.

3.5.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Section **B.1.3** of this application for further discussion.

3.5.2.3 Time-Limited Aging Analysis

TLAAs identified for Containment System components include:

- Fatigue of Suppression Chamber, Vents, and Downcomers (**4.6.1**)
- Fatigue of Torus Attached Pipe and Safety Relief Valve Discharge Lines (**4.6.2**)
- Fatigue of Vent Line and Process Penetration Bellows (**4.6.3**)
- Radiation Degradation of Drywell Expansion Gap Foam (**4.7.4**)

3.5.3 Conclusion

The structural 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 structural components 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 demonstrations provided in Appendix B, the effects of aging associated with the structural 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.

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Table 3.5.1 Summary of Aging Management Evaluations for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 1 Item	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
Common Components of All Types of PWR and BWR Containment					
3.5.1.1	Penetration sleeves, penetration bellows, and dissimilar metal welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.1.6**. See discussion of TLAA in Section **4.6**.
3.5.1.2	Penetration sleeves, bellows, and dissimilar metal welds.	Cracking due to cyclic loading, crack initiation and growth due to SCC	Containment inservice inspection (ISI) and Containment leak rate test	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801 with exceptions See further evaluation in Section **3.5.2.2.1.7**. See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program
3.5.1.3	Penetration sleeves, penetration bellows, and dissimilar metal welds	Loss of material due to corrosion	Containment ISI and Containment leak rate test	No	Consistent with NUREG-1801 with exceptions See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program
3.5.1.4	Personnel airlock and equipment hatch	Loss of material due to corrosion	Containment ISI and containment leak rate test	No	Consistent with NUREG-1801 with exceptions See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program
3.5.1.5	Personnel airlock and equipment hatch	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms	Containment leak rate test and plant technical specifications	No	Consistent with NUREG-1801. See description of AMP in Section: **B.2.1.34**, 10 CFR 50 Appendix J program The applicable plant technical specifications are: 3.6.1.1, Primary Containment 3.6.1.2, Primary Containment Air Lock 5.5.12, Primary Containment Leakage Rate Testing Program
3.5.1.6	Seals, gaskets, and moisture barriers	Loss of sealant and leakage through containment due to deterioration of joint seals, gaskets, and moisture barriers	Containment ISI and containment leak rate test	No	Consistent with NUREG-1801 with exceptions. See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.1 Summary of Aging Management Evaluations for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 1 Item	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
PWR Concrete (Reinforced and Prestressed) and Steel Containment BWR Concrete (Mark II and III) and Steel (Mark I, II, and III) Containment					
3.5.1.7	Concrete elements: foundation, dome, and wall	Aging of accessible and inaccessible concrete areas due to leaching of calcium hydroxide, aggressive chemical attack, and corrosion of embedded steel	Containment ISI	Yes, if aging mechanism is significant for inaccessible areas	Not applicable. BFN has a Mark I Steel Containment. See further evaluation in Section **3.5.2.2.1.1**.
3.5.1.8	Concrete elements: foundation	Cracks, distortion, and increases in components stress level due to settlement	Structures monitoring	No, if within scope of the applicant's structures monitoring	Not applicable. BFN has a Mark I Steel Containment. See further evaluation in Section **3.5.2.2.1.2**.
3.5.1.9	Concrete elements: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures monitoring	No, if within scope of the applicant's structures monitoring program	Not applicable. BFN has a Mark I Steel Containment. See further evaluation in Section **3.5.2.2.1.2**.
3.5.1.10	Concrete elements: foundation, dome, and wall	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete containment that exceed specified temperature limits	Not applicable. BFN has a Mark I Steel Containment. See further evaluation in Section **3.5.2.2.1.3**.
3.5.1.11	Prestressed containment: tendons and anchorage components	Loss of prestress due to relaxation, shrinkage, creep, and elevated temperature	TLAA evaluated in accordance with 10 CFR 54.21(c).	Yes, TLAA	Not applicable. BFN has a Mark I Steel Containment and not prestressed concrete with tendons. See further evaluation in Section **3.5.2.2.1.5**.

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.1 Summary of Aging Management Evaluations for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 1 Item	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.12	Steel elements: liner plate, containment shell	Loss of material due to corrosion in accessible and inaccessible areas	Containment ISI and containment leak rate test	Yes, if corrosion is significant for inaccessible areas	Consistent with NUREG-1801 with exceptions. See further evaluation in Section **3.5.2.2.1.4.** See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program
3.5.1.13	Steel elements: vent header, drywell head, torus, downcomers, and pool shell	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c)	Yes, TLAA	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.1.6**. See discussion of TLAA in Section **4.6.**
3.5.1.14	Steel elements: protected by coating	Loss of material due to corrosion in accessible areas only	Protective coating monitoring and maintenance	No	Not applicable. BFN does not credit coatings to prevent general corrosion.
3.5.1.15	Prestressed containment: tendons and anchorage components	Loss of material due to corrosion of prestressing tendons and anchorage components	Containment ISI	No	Not applicable. BFN has a Mark I Steel Containment and not prestressed concrete with tendons.
3.5.1.16	Concrete elements: foundation, dome, and wall	Scaling, cracking, and spalling due to freeze-thaw; expansion and cracking due to reaction with aggregate	Containment ISI	No	Not applicable. BFN has a Mark I Steel Containment.
3.5.1.17	Steel elements: vent line bellows, vent headers, and downcomers	Cracking due to cyclic loads; crack initiation and growth due SCC	Containment ISI and Containment leak rate test	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801 with exceptions. See further evaluation in Section **3.5.2.2.1.7**. See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program
3.5.1.18	Steel elements: Suppression chamber liner	Crack initiation and growth due to SCC	Containment ISI and containment leak rate test	No	Consistent with NUREG-1801 with exceptions. See description of AMPs in Sections: **B.2.1.32**, ASME Section XI IWE program **B.2.1.34**, 10 CFR 50 Appendix J program

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.1 Summary of Aging Management Evaluations for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 1 Item	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.19	Steel elements: drywell head and downcomer pipes	Fretting and lock up due to wear	Containment ISI	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section: **B.2.1.32**, ASME Section XI IWE program.
Class 1 Structures					
3.5.1.20	All Groups except Group 6: accessible interior/exterior concrete and steel components	All types of aging effects	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.2.1.** See description of AMP in Section: **B.2.1.36**, Structures Monitoring Program.
3.5.1.21	Groups 1-3, 5, 7-9: inaccessible concrete components, such as exterior walls below grade and foundation	Aging of inaccessible concrete areas due to aggressive chemical attack, and corrosion of embedded steel	Plant specific	Yes, if an aggressive below-grade environment exists	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.2.2.** An aggressive below-grade environment does not exist at BFN.
3.5.1.22	Group 6: all accessible/ inaccessible concrete, steel, and earthen components	All types of aging effects, including loss of material due to abrasion, cavitation, and corrosion	Inspection of water-control structures or FERC/US Army Corps of Engineers dam inspection and maintenance	No	Consistent with NUREG-1801 See further evaluations in Section **3.5.2.2.2.1**. An aggressive below-grade environment does not exist at BFN See description of AMP in Section: **B.2.1.37**, Inspection of Water-Control Structures Program
3.5.1.23	Group 5: liners	Crack initiation and growth due to SCC; loss of material due to crevice corrosion	Water chemistry and Monitoring of spent fuel pool water level	No	Consistent with NUREG-1801 with exceptions. See description of AMP in Section: **B.2.1.5**, Chemistry Control program
3.5.1.24	Groups 1-3, 5, 6: all masonry block walls	Cracking due to restraint, shrinkage, creep, and aggressive environment	Masonry Wall	No	Consistent with NUREG-1801. See description of AMP in Section: **B.2.1.35**. Masonry Wall Program

Table 3.5.1 Summary of Aging Management Evaluations for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 1 Item	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1.25	Groups 1-3, 5, 7-9: foundation	Cracks, distortion, and increases in component stress level due to settlement	Structures monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.2.1** See description of AMP in Section: **B.2.1.36**, Structures Monitoring Program
3.5.1.26	Groups 1-3, 5-9: foundation	Reduction in foundation strength due to erosion of porous concrete subfoundation	Structures Monitoring	No, if within the scope of the applicant's structures monitoring program	Not applicable. BFN does not use porous concrete subfoundations. See further evaluation in Section **3.5.2.2.2.1**.
3.5.1.27	Groups 1-5: concrete	Reduction of strength and modulus due to elevated temperature	Plant specific	Yes, for any portions of concrete that exceed specified temperature limits	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.2.1**.
3.5.1.28	Groups 7, 8: liners	Crack initiation and growth due to SCC; loss of material due to crevice corrosion	Plant specific	Yes	Not applicable. BFN does not have any Group 7 structures. BFN does not have in-scope stainless steel liners in an exposed-to-fluid environment for any Group 8 structure.

Table 3.5.1 Summary of Aging Management Evaluations for Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 1 Item	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
Component Supports					
3.5.1.29	All Groups: support members, anchor bolts, concrete surrounding anchor bolts, welds, grout pad, bolted connections etc.	Aging of component supports	Structures Monitoring	No, if within the scope of the applicant's structures monitoring program	Consistent with NUREG-1801 See further evaluation in Section **3.5.2.2.3.1.** See description of AMP in Section: **B.2.1.36,** Structures Monitoring Program
3.5.1.30	Groups B1.1, B1.2, and B1.3: support members, anchor bolts, and welds	Cumulative fatigue damage (CLB fatigue analysis exists)	TLAA evaluated in accordance with 10 CFR 54.21(c).	Yes, TLAA	Consistent with NUREG-1801 See discussion of further evaluation in Section **3.5.2.2.3.2**. See discussion of TLAA in Section **4.6**.
3.5.1.31	PWR only.				
3.5.1.32	Groups B1.1, B1.2, and B1.3: support members, anchor bolts, welds, spring hangers, guides, stops, and vibration isolators	Loss of material due to environmental corrosion; loss of mechanical function due to corrosion, distortion, dirt, overload, etc.	ISI	No	Consistent with NUREG-1801. See description of the AMP in Section: **B.2.1.33**, ASME Section XI Subsection IWF Program
3.5.1.33	Group B1.1: high strength low-alloy bolts	Crack initiation and growth due to SCC	Bolting integrity	No	Exception to NUREG-1801. See Plant Specific Note 2 for table **3.5.2.26.**

Table 3.5.2.1: Primary Containment Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealants	SP	Elastomers	Containment Atmosphere	Loss of sealing and/or leakage through containment due to deterioration of seals, gaskets, and moisture barriers.	ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.3-a	**3.5.1.6**	B
Compressible Joints & Seals	PB	Elastomers	Containment Atmosphere, Inside Air	Loss of sealing and/or leakage through containment due to deterioration of seals, gaskets, and moisture barriers.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.3-a	**3.5.1.6**	B
Controlled Leakage Doors	PB	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.2-a	**3.5.1.4**	B
Controlled Leakage Doors	PB	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms.	10 CFR Part 50 Appendix J Program (**B.2.1.34**)	II.B4.2-b	**3.5.1.5**	A
Controlled Leakage Doors	PB	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.2-a	**3.5.1.4**	B
Controlled Leakage Doors	PB	Carbon and Low Alloy Steel	Inside Air	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms.	10 CFR Part 50 Appendix J Program (**B.2.1.34**)	II.B4.2-b	**3.5.1.5**	A

Table 3.5.2.1: Primary Containment Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	PB, SP	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.2-a	**3.5.1.4**	B
Hatches/Plugs	PB, SP	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms.	10 CFR Part 50 Appendix J Program (**B.2.1.34**)	II.B4.2-b	**3.5.1.5**	A
Hatches/Plugs	PB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.2-a	**3.5.1.4**	B
Hatches/Plugs	PB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of leak tightness in closed position due to mechanical wear of locks, hinges, and closure mechanisms.	10 CFR Part 50 Appendix J Program (**B.2.1.34**)	II.B4.2-b	**3.5.1.5**	A
High Density Shielding Concrete	SH	Reinforced Concrete	Containment Atmosphere	None	None	III.A4.1-a	**3.5.1.20**	I, 1
High Density Shielding Concrete	SH	Reinforced Concrete	Containment Atmosphere	None	None	III.A4.1-b	**3.5.1.20**	I, 1
High Density Shielding Concrete	SH	Reinforced Concrete	Containment Atmosphere	None	None	III.A4.1-c	**3.5.1.27**	I, 1
High Density Shielding Concrete	SH	Reinforced Concrete	Containment Atmosphere	None	None	III.A4.1-d	**3.5.1.20**	I, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.1: Primary Containment Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations, Electrical and I&C	PB, SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II. B4.1-a	**3.5.1.3**	B
Penetrations, Electrical and I&C	PB, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II. B4.1-a	**3.5.1.3**	B
Penetrations, Electrical and I&C	PB, SS	Stainless Steel (Dissimilar metal welds)	Containment Atmosphere	Crack initiation and growth due to SSC.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.1-d	**3.5.1.2**	D
Penetrations, Electrical and I&C	PB, SS	Stainless Steel (Dissimilar metal welds)	Inside Air	Crack initiation and growth due to SSC.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.1-d	**3.5.1.2**	D
Penetrations, Mechanical	PB, SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II. B4.1-a	**3.5.1.3**	B

Table 3.5.2.1: Primary Containment Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations, Mechanical	PB, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II. B4.1-a	**3.5.1.3**	B
Penetrations, Mechanical	SH	Permali	Containment Atmosphere	None	None	None	None	J, 2
Penetrations, Mechanical	SS	Non-ferrous - copper alloys	Containment Atmosphere	None	None	None	None	J, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A4.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A4.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	None	None	III.A4.1-c	**3.5.1.27**	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A4.1-d	**3.5.1.20**	A
Steel Containment Elements	PB, SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B1.1.1-a	**3.5.1.12**	B
Steel Containment Elements	PB, SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	II.B1.1.1-a	**3.5.1.12**	I, 2

Table 3.5.2.1: Primary Containment Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Steel Containment Elements	PB, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B1.1.1-a	**3.5.1.12**	B
Steel Containment Elements	PB, SS	Carbon and Low Alloy Steel	Submerged	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B1.1.1-a	**3.5.1.12**	B
Structural Bellows	PB	Stainless Steel	Containment Atmosphere	Crack initiation and growth due to SSC.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B1.1.1-d	**3.5.1.17**	B
Structural Bellows	PB	Stainless Steel (Dissimilar metal welds)	Containment Atmosphere	Crack initiation and growth due to SSC.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.1-d	**3.5.1.2**	B
Structural Bellows	PB	Stainless Steel	Inside Air	Crack initiation and growth due to SSC.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B1.1.1-d	**3.5.1.17**	B

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.1: Primary Containment Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Structural Bellows	PB	Stainless Steel (Dissimilar metal welds)	Inside Air	Crack initiation and growth due to SSC.	10 CFR Part 50 Appendix J Program (**B.2.1.34**) ASME Section XI Subsection IWE Program (**B.2.1.32**)	II.B4.1-d	**3.5.1.2**	B
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A4.2-a	**3.5.1.20**	A
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Embedded/ Encased	None	None	III.A4.2-a	**3.5.1.20**	I, 2
Structural Steel Beams, Columns, Plates, Trusses	SS	Non-ferrous - lubrite	Containment Atmosphere	None	None	III.A4.2-b	**3.5.1.20**	I, 4

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note D Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. High density shielding concrete (HDSC) is un-reinforced concrete encased between structural steel plates and is inaccessible. See further evaluation in Section **3.5.2.2.2.1.**
2. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.
3. Reduction of strength and modulus due to elevated temperature is not an aging effect requiring management. See further evaluation in Section **3.5.2.2.2.1**
4. Lubrite is not susceptible to lockup due to wear and does not require aging management for the period of extended operation.

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Bolting & Fasteners	SS, PB	Non-ferrous - aluminum	Inside Air	None	None	None	None	J, 1
Caulking and Sealants	FLB, PB	Elastomers	Inside Air, Outside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 2
Compressible Joints & Seals	FLB, PB	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A
Compressible Joints & Seals	FLB, PB	Elastomers	Embedded/encased	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 2
Compressible Joints & Seals	FLB, PB	Elastomers	Inside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 2
Compressible Joints & Seals	FLB, PB	Elastomers	Submerged	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 2
Controlled Leakage Doors	FLB, HE/ME, PB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion, mechanical wear.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A
Controlled Leakage Doors	FLB, HE/ME, PB, SP	Non-ferrous - copper alloys	Inside Air	Loss of material due to mechanical wear.	Structures Monitoring Program (B.2.1.36)	None	None	J, 3
Controlled Leakage Doors	FLB, HE/ME, PB, SP	Stainless Steel	Inside Air	None	None	None	None	J, 1
Expansion Joint	ES/SEP	Elastomers - Polyurethane foam	Embedded/encased	Hardening, loss of strength due to elastomer degradation.	TLAA, (4.7.4)	None	None	J, 4
Fire Barriers	FB	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Fire Protection Program (B.2.1.23)	None	None	J, 2
Fire Barriers	FB	Carbon and Low Alloy Steel	Inside Air	Loss of material due to mechanical wear.	Fire Protection Program (B.2.1.23)	VII.G.3-d	3.3.1.20	A
Fire Barriers -	FB	Elastomers	Inside Air	Increased hardness, shrinkage due to weathering.	Fire Protection Program (B.2.1.23)	VII.G.3-a	3.3.1.20	A

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fire Barriers	FB	Gypsum	Inside Air	Cracking due to vibration. Loss of material due to abrasion.	Fire Protection Program (**B.2.1.23**)	None	None	J, 2
Fire Barriers	FB	Ceramic fiber	Inside Air	None	None	None	None	J, 1
Fire Barriers	FB	Coatings (ALBI CLAD-161)	Inside Air	Cracking due to vibration. Loss of material due to abrasion, flaking.	Fire Protection Program (**B.2.1.23**)	None	None	J, 2
Fire Barriers	FB	Masonry	Inside Air	Cracking due to restraint, shrinkage, creep, aggressive environment.	Fire Protection Program (**B.2.1.23**) Masonry Wall Program (**B.2.1.35**)	VII.G.3-c	None	F, 2
Fire Barriers	FB	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Fire Protection Program (**B.2.1.23**) Structures Monitoring Program (**B.2.1.36**)	VII.G.3-b	**3.3.1.30**	A
Fire Barriers	FB	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Fire Protection Program (**B.2.1.23**) Structures Monitoring Program (**B.2.1.36**)	VII.G.3-c	**3.3.1.30**	A
Fire Barriers	FB	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack. Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Fire Protection Program (**B.2.1.23**) Structures Monitoring Program (**B.2.1.36**)	VII.G.3-b	**3.3.1.30**	A
Fire Barriers	FB	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Fire Protection Program (**B.2.1.23**) Structures Monitoring Program (**B.2.1.36**)	VII.G.3-c	**3.3.1.30**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	SP, SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A2.2-a	None	I, 1
Hatches/Plugs	SP, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-c	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-d	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-f	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A2.1-j	None	I, 5
Masonry Block	SS, SS(NSR)	Masonry	Inside Air	Cracking due to restraint, shrinkage, creep, aggressive environment.	Masonry Wall Program (**B.2.1.35**)	III.A2.3-a	**3.5.1.24**	A
Metal Roofing	PB, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A
Metal Siding	PB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A
Metal Siding	PB, SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A
Penetrations, Electrical and I&C	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A2.2-a	None	I, 1

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations, Electrical and I&C	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A
Penetrations, Electrical and I&C	SS, SS(NSR)	Non-ferrous - aluminum	Embedded/encased	None	None	None	None	J, 1
Penetrations, Electrical and I&C	SS, SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	None	None	J, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A2.2-a	None	I, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A
Penetrations, Mechanical	SS, SS(NSR)	Stainless Steel	Embedded/encased	None	None	None	None	J, 1
Penetrations, Mechanical	SS, SS(NSR)	Stainless Steel	Inside Air	None	None	None	None	J, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-b	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-c	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-e	None	I, 8
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-g	None	I, 9

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-h	None	I, 10
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36)**	III.A2.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A2.1-h	None	I, 10
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A2.1-j	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-d	**3.5.1.20**	A

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, HE/ME, MB, PB, SH, SP, SS	Reinforced Concrete	Outside Air	None	None	III.A2.1-h	None	I, 10
Roof Membrane	SP	Roof Membrane	Outside Air	Loss of weatherproofing integrity due to cracking, drying, organic decomposition, separation, shrinkage, wear, weathering.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 2
Spent Fuel Pool Liners	PB	Stainless Steel	Embedded/encased	None	None	III.A5.2-b	None	G, 1
Spent Fuel Pool Liners	PB	Stainless Steel	Inside Air	None	None	III.A5.2-b	None	G, 1
Spent Fuel Pool Liners	PB	Stainless Steel	Submerged	Loss of material due to crevice corrosion, pitting corrosion. Crack initiation and growth due to SSC.	Chemistry Control Program (**B.2.1.5**)	III.A5.2-b	**3.5.1.23**	B
Spent Fuel Storage Racks	CC, SS	Boral	Submerged	Reduction of neutron-absorbing capacity. Loss of material due to general corrosion.	Chemistry Control Program (**B.2.1.5**)	VII.A2.1-b	**3.3.1.10**	B
Spent Fuel Storage Racks (includes New Fuel Storage Racks)	CC, SS	Non-ferrous - aluminum	Inside Air	None	None	VII.A1.1-a	None	F, 1
Spent Fuel Storage Racks	CC, SS	Stainless Steel	Submerged	Crack initiation and growth due to SSC.	Chemistry Control Program (**B.2.1.5**)	VII.A2.1-c	**3.3.1.13**	B
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A2.2-a	None	I, 1

Table 3.5.2.2: Reactor Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note F Material not in NUREG-1801 item for this component.]

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

2 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

3 Loss of material due to mechanical wear occurs through the use of the door.

4 The aging effects identified for this material/environment combination are consistent with industry guidance.

5 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section 3.5.2.2.2.1.

6 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

7 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

8 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

9 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

10 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.3: Equipment Access Lock - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealants	FLB, PB	Elastomers	Inside Air, Outside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Compressible Joints & Seals	FLB, PB	Elastomers	Inside Air, Outside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Controlled Leakage Doors	FLB, PB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion, mechanical wear.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A
Controlled Leakage Doors	FLB, PB, SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to general corrosion, crevice corrosion, pitting corrosion, mechanical wear.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A
Controlled Leakage Doors	FLB, PB, SP	Non-ferrous - copper alloys	Outside Air	Loss of material due to mechanical wear.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Controlled Leakage Doors	FLB, PB, SP	Stainless Steel	Outside Air	Loss of material due to mechanical wear.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A2.2-a	None	I, 2
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A2.2-a	None	I, 2
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A2.2-a	3.5.1.20	A
Piles	SS	Carbon and Low Alloy Steel	Buried	None	None	III.A2.2-a	None	I, 3

Table 3.5.2.3: Equipment Access Lock - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A2.1-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-b	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-c	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-e	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-g	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Buried	None	None	III.A2.1-h	None	I, 8
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A2.1-c	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling and scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A2.1-d	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A2.1-f	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A2.1-h	None	I, 8

Table 3.5.2.3: Equipment Access Lock - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A2.1-j	None	I, 9
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A2.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, PB, SP, SS	Reinforced Concrete	Outside Air	None	None	III.A2.1-h	**3.5.1.25**	I, 8
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to general corrosion, crevice corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A2.2-a	**3.5.1.20**	A

Table Notes:

Industry standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. This is a non-significant aging effect that does not require aging management.

4 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

6 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

7 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

8 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1**.

9 Conditional requirements for elevated temperature are satisfied. Therefore a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.4: Earth Berm - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Intake Canals, Dikes, Embankments	SS	Rock and Earthfill	Outside Air, Buried	Loss of material, loss of form due to erosion, settlement, sedimentation, frost action.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1

Table Notes:

Industry Standard Notes:

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

Table 3.5.2.5: Diesel Generator Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealants	FLB, PB	Elastomers	Inside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Caulking and Sealants	FLB, PB	Elastomers	Outside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Compressible Joints & Seals	FLB	Elastomers	Inside Air, Outside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Controlled Leakage Doors	FLB, MB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion, mechanical wear.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Controlled Leakage Doors	FLB, MB, SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion, mechanical wear.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Controlled Leakage Doors	FLB, MB, SP	Non-ferrous - Copper alloy	Outside Air	Loss of material due to mechanical wear.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Controlled Leakage Doors	FLB, MB, SP	Stainless Steel	Outside Air	Loss of material due to mechanical wear.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Fire Barriers	FB	Carbon and Low Alloy Steel	Inside Air	Loss of material due to mechanical wear.	Fire Protection Program (B.2.1.23)	VII.G.4-d	3.3.1.20	A
Fire Barriers	FB	Elastomers	Inside Air	Increased hardness, shrinkage due to weathering.	Fire Protection Program (B.2.1.23)	VII.G.4-a	3.3.1.20	A
Fire Barriers	FB	Ceramic fiber	Inside Air	None	None	None	None	J, 2
Fire Barriers	FB	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Fire Protection Program (B.2.1.23) Structures Monitoring Program (B.2.1.36)	VII.G.4-b	3.3.1.30	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.5: Diesel Generator Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Fire Barriers	FB	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Fire Protection Program (B.2.1.23) Structures Monitoring Program (B.2.1.36)	VII.G.4-c	3.3.1.30	A
Fire Barriers	FB	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack, freeze-thaw.	Fire Protection Program (B.2.1.23) Structures Monitoring Program (B.2.1.36)	VII.G.4-b	3.3.1.30	A
Fire Barriers	FB	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Fire Protection Program (B.2.1.23) Structures Monitoring Program (B.2.1.36)	VII.G.4-c	3.3.1.30	A
Hatches/Plugs	SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Hatches/Plugs	SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36))	III.A3.2-a	3.5.1.20	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A3.1-c	3.5.1.20	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A3.1-d	3.5.1.20	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.5: Diesel Generator Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 3
Hatches/Plugs	SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Hatches/Plugs	SP, SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Masonry Block	SS(NSR)	Masonry	Inside Air	Cracking due to restraint, shrinkage, creep, aggressive environment.	Masonry Wall Program (**B.2.1.35**)	III.A3.3-a	**3.5.1.24**	A
Metal Siding	PB, SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Metal Siding	PB, SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Penetrations, Electrical and I&C	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 2

Table 3.5.2.5: Diesel Generator Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations, Electrical and I&C	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Electrical and I&C	SS, SS(NSR)	Non-ferrous - aluminum	Embedded/encased	None	None	None	None	J, 2
Penetrations, Electrical and I&C	SS, SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	None	None	J, 2
Penetrations, Electrical and I&C	SS, SS(NSR)	Non-ferrous - aluminum	Outside Air	None	None	None	None	J, 2
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 2
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scalling), cracking, duefreeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A3.1-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 7

Table 3.5.2.5: Diesel Generator Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scalling), cracking, duefreeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A

Table 3.5.2.5: Diesel Generator Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG - 1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, MB, SP, SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A
Structural Steel Beams, Columns, Plates, Trusses	FLB, SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Structural Steel Beams, Columns, Plates, Trusses	FLB, SS, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A

Table Notes:

Industry standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.
2. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.
3. Conditional requirements for elevated temperature are satisfied. Therefore, plant specific aging management program is not required. See further evaluation in Section 3.5.2.2.2.1.

4. For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.
5. For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.
6. For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.
7. For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

Table 3.5.2.6: Standby Gas Treatment Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scalling), cracking due freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.6: Standby Gas Treatment Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.6: Standby Gas Treatment Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A

Table Notes:

Industry standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

2 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section 3.5.2.2.2.1.

3 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section 3.5.2.2.2.1.

4 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section 3.5.2.2.2.2.

5 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section 3.5.2.2.2.2.

6 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section 3.5.2.2.2.1.

Table 3.5.2.7: Off-Gas Treatment Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealants	PB	Elastomers	Inside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Penetrations, Mechanical	PB	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 2
Penetrations, Mechanical	PB	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Buried	None	None	III.A3.1-h	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A

Table 3.5.2.7: Off-Gas Treatment Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Inside Air	None	None	III.A3.1-h	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 8
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	PB	Reinforced Concrete	Outside Air	None	None	III.A3.1-h	None	I, 7

Table Notes:

Industry standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

6 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

7 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1**.

8 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.8: Vacuum Pipe Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Hatches/Plugs	SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Electrical and I&C	SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Electrical and I&C	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A3.1-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 5

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.8: Vacuum Pipe Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	Cracks, distortion, increase incomponent stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A

Table 3.5.2.8: Vacuum Pipe Building - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

2 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

5 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

6 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.9: Residual Heat Removal Service Water Tunnels - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Compressible Joints & Seals	DP, SP	Elastomers	Buried	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 2
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Piles	SS(NSR)	Carbon and Low Alloy Steel	Buried	None	None	III.A3.2-a	None	I, 3
Piles	SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 2
Tunnels	SP, SS(NSR)	Carbon and Low Alloy Steel	Buried	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Tunnels	SP, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A3.1-a	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 4
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 5
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 6
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 7
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-h	None	I, 8
Tunnels	SP, SS(NSR)	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A3.1-a	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (B.2.1.36)	III.A3.1-b	3.5.1.20	A

Table 3.5.2.9: Residual Heat Removal Service Water Tunnels - Summary Of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tunnels	SP, SS(NSR)	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A3.1-c	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Outside Air	Cracking, loss of bond and loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A3.1-d	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Outside Air	None	None	III.A3.1-h	None	I, 8

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. This is a non-significant aging effect that does not require aging management.

4 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

6 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

7 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2.**

8 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1.**

Table 3.5.2.10: Electrical Cable Tunnel from Intake Pumping Station to the Powerhouse - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Fire Barriers	FB	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates. Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Fire Protection Program (**B.2.1.23**) Structures Monitoring Program (**B.2.1.36**)	VII.G.2-b	**3.3.1.30**	A
Fire Barriers	FB	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Fire Protection Program (**B.2.1.23**) Structures Monitoring Program (**B.2.1.36**)	VII.G.2-c	**3.3.1.30**	A
Penetrations, Electrical and I&C	SP, SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Electrical and I&C	SP, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Penetrations, Electrical and I&C	SP, SS	Non-ferrous - aluminum	Embedded/encased	None	None	None	None	J, 1
Penetrations, Electrical and I&C	SP, SS	Non-ferrous - aluminum	Inside Air	None	None	None	None	J, 1
Tunnels	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-a	None	I, 2
Tunnels	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 3
Tunnels	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 4
Tunnels	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 5
Tunnels	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 6

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.10: Electrical Cable Tunnel from Intake Pumping Station to the Powerhouse - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tunnels	SP, SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Tunnels	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Tunnels	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Tunnels	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Tunnels	SP, SS	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Tunnels	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 7

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

2 For Loss of material (spalling, scaling) and cracking due to freeze-thaw for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

6 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2.**

7 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.11: Underground Concrete Encased Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealants	FLB, SP	Elastomers	Buried, Embedded/encased, Inside Air, Outside Air	Hardening, loss of strength due to elastomer degradation.	Structures Monitoring Program (B.2.1.36)	None	None	J, 1
Duct Banks, Manholes	SP, SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 2
Duct Banks, Manholes	SP, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Duct Banks, Manholes	SP, SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A3.1-a	3.5.1.20	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 3
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 4
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 5
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 6
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A3.1-c	3.5.1.20	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A3.1-d	3.5.1.20	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A

Table 3.5.2.11: Underground Concrete Encased Structures - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 7
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Duct Banks, Manholes	SP, SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

6 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

7 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.12: Intake Pumping Station - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Caulking and Sealants	FLB, SP	Elastomers	Outside Air, Inside Air	Hardening, loss of strength due to elastomer degradation	Inspection of Water-Control Structures Program (**B.2.1.37**)	None	None	J, 1
Compressible Joints & Seals	FLB, SP	Elastomers	Outside Air	Hardening, loss of strength due to elastomer degradation	Inspection of Water-Control Structures Program (**B.2.1.37**)	None	None	J, 1
Controlled Leakage Doors	FLB, SP, SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion, mechanical wear	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A
Controlled Leakage Doors	FLB, SP, SS	Non-ferrous - copper alloys	Outside Air	Loss of material due to mechanical wear.	Inspection of Water-Control Structures Program (**B.2.1.37**)	None	None	J, 1
Controlled Leakage Doors	FLB, SP, SS	Stainless Steel	Outside Air	Loss of material due to mechanical wear.	Inspection of Water-Control Structures Program (**B.2.1.37**)	None	None	J, 1
Fire Barriers	FB	Thermolag	Inside Air	Cracking due to vibration. Loss of material due to abrasion.	Fire Protection Program **(B.2.1.23)**	None	None	J, 1
Masonry Block	SS(NSR)	Masonry Block	Inside Air	Cracking due to restraint, shrinkage, creep, aggressive environment.	Masonry Wall Program (**B.2.1.35**)	III.A6.3-a	**3.5.1.24**	A
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A6.2-a	None	I, 2
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Non-ferrous - aluminum	Embedded/encased	None	None	None	None	J, 2
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	None	None	J, 2

Table 3.5.2.12: Intake Pumping Station - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Penetrations, Electrical and I&C	SP, SS, SS(NSR)	Non-ferrous - aluminum	Outside Air	None	None	None	None	J, 2
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A6.2-a	None	I, 2
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-a	**3.5.1.22**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Buried	None	None	III.A6.1-b	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Buried	None	None	III.A6.1-c	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Buried	None	None	III.A6.1-d	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Buried	None	None	III.A6.1-e	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Buried	None	None	III.A6.1-f	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A6.1-a	None	I, 8
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-b	**3.5.1.22**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-c	**3.5.1.22**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.12: Intake Pumping Station - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-d	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-e	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Inside Air	None	None	III.A6.1-f	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-a	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-b	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-c	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-d	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-e	3.5.1.22	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Outside Air	None	None	III.A6.1-f	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.1-a	3.5.1.22	A

Table 3.5.2.12: Intake Pumping Station - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	None	III.A6.1-b	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	None	None	III.A6.1-c	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	None	None	III.A6.1-d	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	None	None	III.A6.1-e	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	None	None	III.A6.1-f	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	FLB, SP, SS	Reinforced Concrete	Submerged	None	None	III.A6.1-h	None	I, 9
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	C
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	C

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

3 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

6 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

7 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1**.

8 The interior slab is not weather exposed and not subject to loss of material or cracking due to freeze-thaw.

9 Loss of material due to abrasion and cavitation for concrete will not require aging management. Abrasion and cavitation occur only in reinforced concrete structures and components that are continuously exposed to flowing water. Cavitation damage is not common if velocities are less than 40 fps according to EPRI TR-104305. The abrasion threshold is 4 fps according to EPRI TR-110025. The estimated average velocity of water into a bay of the Intake Pumping Station with a CCW pump operating at maximum capacity of 220,000 gpm with a minimum pool height (assuming a breach of Wheeler Dam) is less than 4 fps.

Table 3.5.2.13: Gate Structure No. 3 - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piles	FD, SS	Carbon and Low Alloy Steel	Buried	None	None	III.A6.2-a	**None**	I, 1
Piles	FD, SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A
Piles	FD, SS	Carbon and Low Alloy Steel	Submerged	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-a	**3.5.1.22**	C
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-b	**3.5.1.22**	C
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-c	**3.5.1.22**	C
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-d	**3.5.1.22**	C
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.1-e	**3.5.1.22**	C
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	None	None	III.A6.1-f	**3.5.1.22**	I, 2
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A6.2-a	None	I, 3
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.2-a	**3.5.1.22**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1. NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. This is a non-significant aging effect that does not require aging management.

2. 3. Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1**.

3. There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.5.2.14: Intake Channel - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Intake Canals, Dikes, Embankments	SCW, SS	Earthfill (clay and in-situ soil)	Outside, Buried, Submerged	Loss of material, loss of form due to erosion, sedimentation, frost action, seepage.	Inspection of Water-Control Structures Program (**B.2.1.37**)	III.A6.4-a	**3.5.1.22**	A

Table Notes:

Industry Standard:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Plant Specific Notes:

None

Table 3.5.2.15: North Bank of Cool Water Channel East of Gate Structure No. 2 - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Intake Canals, Dikes, Embankments	SS	Earthfill (clay and in-situ soil)	Outside, Buried, Submerged	Loss of material, loss of form due to erosion, sedimentation, frost action, seepage.	Inspection of Water-Control Structures Program (B.2.1.37)	III.A6.4-a	3.5.1.22	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Plant Specific Notes:

None

Table 3.5.2.16: South Dike of Cool Water Channel Between Gate Structure Nos. 2 and 3 - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Intake Canals, Dikes, Embankments	SS	Earthfill (clay and in-situ soil)	Outside Air, Buried, Submerged	Loss of material, loss of form due to erosion, sedimentation, frost action, seepage.	Inspection of Water-Control Structures (B.2.1.37)	III.A6.4-a	3.5.1.22	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Plant Specific Notes:

None

Table 3.5.2.17: Condensate Water Storage Tanks' Foundations and Trenches - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Equipment Supports & Foundations	SS	Earthfill (rock and sand)	Buried	None	None	None	None	J, 1
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-a	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-b	None	I, 2
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-c	None	I, 3
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-d	None	I, 4
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-e	None	I, 5
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-f	**3.5.1.25**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-a	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-b	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-c	**3.5.1.20**	A

Table 3.5.2.17: Condensate Water Storage Tanks' Foundations and Trenches - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-d	**3.5.1.21**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-e	**3.5.1.21**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-f	**3.5.1.25**	A
Penetrations, Electrical and I&C	SP, SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A8.2-a	None	I, 6
Penetrations, Electrical and I&C	SP, SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A8.2-a	**3.5.1.20**	A
Penetrations, Mechanical	SS	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A8.2-a	None	I, 6
Penetrations, Mechanical	SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A8.2-a	**3.5.1.20**	A
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A8.2-a	**3.5.1.20**	A
Trenches	SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-a	**3.5.1.20**	A
Trenches	SP, SS	Reinforced Concrete	Buried	None	None	III.A8.1-b	None	I, 2
Trenches	SP, SS	Reinforced Concrete	Buried	None	None	III.A8.1-c	None	I, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.17: Condensate Water Storage Tanks' Foundations and Trenches - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Trenches	SP, SS	Reinforced Concrete	Buried	None	None	III.A8.1-d	None	I, 4
Trenches	SP, SS	Reinforced Concrete	Buried	None	None	III.A8.1-e	None	I, 5
Trenches	SP, SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-f	**3.5.1.25**	A
Trenches	SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-a	**3.5.1.20**	A
Trenches	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-b	**3.5.1.20**	A
Trenches	SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-c	**3.5.1.20**	A
Trenches	SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-d	**3.5.1.21**	A
Trenches	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-e	**3.5.1.21**	A
Trenches	SP, SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-f	**3.5.1.25**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The earthen materials of the CWST foundation interior base are protected from environmental weathering conditions by the concrete perimeter ring and CWST tank bottom.

2 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

5 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

6 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.5.2.18: Containment Atmosphere Dilution Storage Tanks' Foundations - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-a	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-b	None	I, 1
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-c	None	I, 2
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-d	None	I, 3
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	None	None	III.A8.1-e	None	I, 4
Equipment Supports & Foundations	SS	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-f	**3.5.1.25**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-a	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-b	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-c	**3.5.1.20**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-d	**3.5.1.21**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-e	**3.5.1.21**	A
Equipment Supports & Foundations	SS	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A8.1-f	**3.5.1.25**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

2 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

4 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

Table 3.5.2.19: Reinforced Concrete Chimney - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs	SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Hatches/Plugs	SP	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-c	**3.5.1.20**	A
Hatches/Plugs	SP	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-d	**3.5.1.20**	A
Hatches/Plugs	SP	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-f	**3.5.1.20**	A
Hatches/Plugs	SP	Reinforced Concrete	Inside Air	None	None	III.A9.1-h	None	I, 2
Metal Roofing	SP, SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Penetrations, Electrical and I&C	SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	None	None	J, 3
Penetrations, Electrical and I&C	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Buried	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	None	None	J, 3
Penetrations, Mechanical	SS, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A9.1-b	None	I, 4

Table 3.5.2.19: Reinforced Concrete Chimney - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A9.1-c	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A9.1-e	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A9.1-g	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Buried	None	None	III.A9.1-h	None	I, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-f	**3.5.1.20**	A,
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Inside Air	None	None	III.A9.1-h	None	I, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-b	**3.5.1.20**	A

Table 3.5.2.19: Reinforced Concrete Chimney - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A9.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS	Reinforced Concrete	Outside Air	None	None	III.A9.1-h	**3.5.1.25**	I, 2
Roof Membrane	SP	Roof Membrane	Inside Air, Outside Air	Loss of weatherproofing integrity due to cracking, drying, organic decomposition, separation, shrinkage, wear, weathering.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Structural Steel Beams, Columns, Plates, Trusses	SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program **(B.2.1.36**)	None	None	J, 1

Table Notes:

Industry Standard Notes:

Note A	Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I	Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J	Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1**.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

5 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

6 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

7 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2.**

Table 3.5.2.20: Turbine Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Hatches/Plugs (F.1)	SS(NSR)	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A3.1-d	3.5.1.20	A
Hatches/Plugs (F.1)	SS(NSR)	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A
Hatches/Plugs (F.1)	SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-h	None	I, 1
Hatches/Plugs (F.1)	SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 2
Hatches/Plugs (F.1)	SS(NSR)	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	IIIA3.1-c	3.5.1.20	A
Masonry Block	SS(NSR)	Masonry	Inside Air	Cracking due to restraint, shrinkage, creep, aggressive environment.	Masonry Wall Program (B.2.1.35)	III.A3.3-a	3.5.1.24	A
Metal Roofing	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	3.5.1.20	I, 3
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Mechanical	SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 3
Penetrations, Mechanical	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.20: Turbine Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piles	SS(NSR)	Carbon and Low Alloy Steel	Buried	None	None	III.A3.2-a	None	I, 4
Piles	SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 5
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 6
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 7
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 8
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-h	None	I, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.20: Turbine Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-h	None	I, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SP, SS(NSR)	Reinforced Concrete	Outside Air	None	None	III.A3.1-h	None	I, 1
Roof Membrane	SP	Roof Membrane	Outside Air	Loss of weatherproofing integrity due to cracking, drying, organic decomposition, separation, shrinkage, wear, weathering.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 9

Table 3.5.2.20: Turbine Buildings - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section 3.5.2.2.2.1.

2 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section 3.5.2.2.2.1.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. This is a non-significant aging effect that does not require aging management.

5 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section 3.5.2.2.2.1.

6 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

7 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

8 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

9 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

Table 3.5.2.21: Diesel High Pressure Fire Pump House - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Metal Roofing	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Metal Siding	SP	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Metal Siding	SP	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Electrical and I&C	SP, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Mechanical	SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	III.A3.2-a	None	I, 1
Penetrations, Mechanical	SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Penetrations, Mechanical	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Piles	SS(NSR)	Carbon and Low Alloy Steel	Buried	None	None	III.A3.2-a	None	I, 2
Piles	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Piles	SS(NSR)	Carbon and Low Alloy Steel	Submerged	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A3.1-c	3.5.1.20	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.21: Diesel High Pressure Fire Pump House - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-h	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A

Table 3.5.2.21: Diesel High Pressure Fire Pump House - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	None	None	III.A3.1-h	None	I, 3
Roof Membrane	SP	Roof Membrane	Outside Air	Loss of weatherproofing integrity due to cracking, drying, organic decomposition, separation, shrinkage, wear, weathering.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 5
Structural Steel Beams, Columns, Plates, Trusses	DP, SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Structural Steel Beams, Columns, Plates, Trusses	DP, SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Structural Steel Beams, Columns, Plates, Trusses	DP, SS(NSR)	Stainless Steel	Outside Air	None	None	None	None	J, 1
Structural Steel Beams, Columns, Plates, Trusses	DP, SS(NSR)	Stainless Steel	Submerged	Loss of material due to crevice corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 5

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

2 NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. This is a non-significant aging effect that does not require aging management.

3 Cracks, distortion, increase in component stress level due to settlement are not aging effects requiring management for structures founded on rock or bearing piles. See further evaluation in Section **3.5.2.2.2.1.**

4 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

5 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

Table 3.5.2.22: Vent Vaults - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Buried	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (B.2.1.36)	III.A3.1-a	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 2
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 4
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A3.1-c	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A3.1-d	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 5

Table 3.5.2.22: Vent Vaults - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Loss of material (spalling, scaling) and cracking due to freeze-thaw.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-a	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-b	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS(NSR)	Reinforced Concrete	Outside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

2 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

4 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2.**

5 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.23: Transformer Yard - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Piles	SS(NSR)	Carbon and Low Alloy Steel	Buried	None	None	III.A3.2-a	None	I, 1
Piles	SS(NSR)	Carbon and Low Alloy Steel	Embedded/Encased	None	None	III.A3.2-a	None	I, 2
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 NUREG 1557 Table B9 states that steel piles driven in undisturbed soil have been unaffected by corrosion and those driven in disturbed soil experience minor to moderate corrosion to a small area of metal. This is a non-significant aging effect that does not require aging management.

2 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

Table 3.5.2.24: 161 kV Switchyard - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.A3.2-a	**3.5.1.20**	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-a	None	I, 1
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 2
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 3
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 4
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 5
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-c	**3.5.1.20**	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-d	**3.5.1.20**	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-f	**3.5.1.20**	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (**B.2.1.36**)	III.A3.1-h	**3.5.1.25**	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 6

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 For loss of material (spalling, scaling) and cracking due to freeze-thaw for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

2 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

5 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2.**

6 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1**.

Table 3.5.2.25: 500 kV Switchyard - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Structural Steel Beams, Columns, Plates, Trusses	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.A3.2-a	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-a	None	I, 1
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-b	None	I, 2
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-c	None	I, 3
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-e	None	I, 4
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	None	None	III.A3.1-g	None	I, 5
Tunnels	SP, SS(NSR)	Reinforced Concrete	Buried	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Expansion and cracking due to reaction with aggregates.	Structures Monitoring Program (B.2.1.36)	III.A3.1-c	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel.	Structures Monitoring Program (B.2.1.36)	III.A3.1-d	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack.	Structures Monitoring Program (B.2.1.36)	III.A3.1-f	3.5.1.20	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	Cracks, distortion, increase in component stress level due to settlement.	Structures Monitoring Program (B.2.1.36)	III.A3.1-h	3.5.1.25	A
Tunnels	SP, SS(NSR)	Reinforced Concrete	Inside Air	None	None	III.A3.1-j	None	I, 6

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Plant Specific Notes:

1 For loss of material (spalling, scaling) and cracking due to freeze-thaw for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

2 For increase in porosity and permeability, loss of strength due to leaching of calcium hydroxide of concrete in inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

3 For expansion and cracking due to reaction with aggregates of concrete in inaccessible areas, no aging management is required. See further evaluation in Section **3.5.2.2.2.1**.

4 For cracking, loss of bond, loss of material (spalling, scaling) due to corrosion of embedded steel in concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2**.

5 For increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack of concrete for inaccessible areas, no plant specific aging management is required. See further evaluation in Section **3.5.2.2.2.2.**

6 Conditional requirements for elevated temperature are satisfied. Therefore, a plant specific aging management program is not required. See further evaluation in Section **3.5.2.2.2.1.**

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.1.1-a	**3.5.1.32**	B
ASME Equivalent Supports and Components	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion. Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.1.1-a	None	G, 1
ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Containment Atmosphere	None	None	III.B1.1.2-a	None	I, 2
ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads.	ASME Section XI, Subsection IWF Program (B.2.1.33)	III.B1.1.3-a	**3.5.1.32**	B
ASME Equivalent Supports and Components	SS	Stainless Steel	Containment Atmosphere	None	None	III.B1.1.3-a	None	I, 3
ASME Equivalent Supports and Components	SS	Stainless Steel	Inside Air	None	None	III.B1.1.3-a	None	G, 3
ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.2.1-a	**3.5.1.32**	B
ASME Equivalent Supports and Components	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.2.1-a	**3.5.1.32**	B
ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.2.1-a	None	G, 1
ASME Equivalent Supports and Components	SS	Stainless Steel	Inside Air	None	None	III.B1.2.1-a	None	F, 3

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
ASME Equivalent Supports and Components	SS	Stainless Steel	Submerged	Loss of material due to crevice corrosion, pitting corrosion.	Chemistry Control Program (**B.2.1.5**) One Time Inspection (**B.2.1.29**)	III.B1.2.1-a	None	F, 1
ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.2.2-a	**3.5.1.32**	B
ASME Equivalent Supports and Components	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	III.B1.2.2-a	**3.5.1.32**	B
ASME Equivalent Supports and Components	SS	Non-ferrous - aluminum	Inside Air	None	None	III.B1.2.2-a	None	I, 3
ASME Equivalent Supports and Components	SS	Stainless Steel	Containment Atmosphere	None	None	III.B1.2.2-a	None	I, 3
ASME Equivalent Supports and Components	SS	Stainless Steel	Inside Air	None	None	III.B1.2.2-a	None	I, 3
ASME Equivalent Supports and Components	SS	Cast Iron and Cast Iron Alloys	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	ASME Section XI, Subsection IWF Program (**B.2.1.33**)	None	None	J, 1
ASME Equivalent Supports and Components	SS	Stainless Steel	Outside Air	None	None	None	None	J, 3
Cable Trays & Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	C
Cable Trays & Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	C

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Conduit & Supports	SP, SS, and/or SS(NSR)	Carbon and Low Alloy Steel	Embedded/encased	None	None	None	None	J, 3
Conduit & Supports	SP, SS, and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	None	None	J, 1
Conduit & Supports	SP, SS, and/or SS(NSR)	Non-ferrous - aluminum	Containment Atmosphere	None	None	None	None	J, 3
Conduit & Supports	SP, SS, and/or SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	None	None	J, 3
Conduit & Supports	SP, SS, and/or SS(NSR)	Non-ferrous - aluminum	Outside Air	None	None	None	None	J, 3
Conduit & Supports	SP, SS, and/or SS(NSR)	Stainless Steel	Containment Atmosphere	None	None	None	None	J, 3
Duct Banks, Manholes	SS	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	**3.5.1.29**	A
Duct Banks, Manholes	SS	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	**3.5.1.29**	A
Electrical Panels, Racks, Cabinets, & Other Enclosures(SI Only)	SP, SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B3.1-a	**3.5.1.29**	A

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Electrical Panels, Racks, Cabinets, & Other Enclosures(SI Only)	SP, SS, and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B3.1-a	**3.5.1.29**	A
Electrical Panels, Racks, Cabinets, & Other Enclosures(SI Only)	SP, SS, and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B3.1-a	None	G, 1
Electrical Panels, Racks, Cabinets, & Other Enclosures(SI Only)	SP, SS, and/or SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	III.B3.1-a	None	F, 3
Electrical Panels, Racks, Cabinets, & Other Enclosures(SI Only)	SP, SS	Stainless Steel	Containment Atmosphere	None	None	III.B3.1-a	None	F, 3
Electrical Panels, Racks, Cabinets, & Other Enclosures(SI Only)	SP, SS, and/or SS(NSR)	Stainless Steel	Inside Air	None	None	III.B3.1-a	None	F, 3
Equipment Supports & Foundations	SS and/or SS(NSR)	Non-ferrous - lubrite	Inside Air	None	None	III.B1.2.2-a	None	I, 3
Equipment Supports & Foundations	SS and/or SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	None	G, 1
Equipment Supports & Foundations	SS and/or SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	None	G, 1

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Equipment Supports & Foundations	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B4.1-a	3.5.1.29	A
Equipment Supports & Foundations	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B4.1-a	3.5.1.29	A
Equipment Supports & Foundations	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.B4.1-a	None	G, 1
Equipment Supports & Foundations	SS(NSR)	Reinforced Concrete	Buried	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (B.2.1.36)	III.B4.3-a	None	G, 4
Equipment Supports & Foundations	SS and/or SS(NSR)	Reinforced Concrete	Containment Atmosphere	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (B.2.1.36)	III.B4.3-a	3.5.1.29	A
Equipment Supports & Foundations	SS and/or SS(NSR)	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (B.2.1.36)	III.B4.3-a	3.5.1.29	A
Equipment Supports & Foundations	SS and/or SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (B.2.1.36)	III.B4.3-a	None	G, 1
HVAC Duct Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B2.1-a	3.5.1.29	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
HVAC Duct Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	A
HVAC Duct Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	None	G, 1
Instrument Line Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	A
Instrument Line Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	A
Instrument Line Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	None	G, 1
Instrument Line Supports	SS and/or SS(NSR)	Stainless Steel	Containment Atmosphere	None	None	III.B2.1-a	None	F, 3
Instrument Line Supports	SS and/or SS(NSR)	Stainless Steel	Inside Air	None	None	III.B2.1-a	None	F, 3
Instrument Racks, Frames, Panels, & Enclosures(SI Only)	SP, SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B3.1-a	**3.5.1.29**	A
Non-ASME Equivalent Supports and Components	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	A
Non-ASME Equivalent Supports and Components	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	**3.5.1.29**	A
Non-ASME Equivalent Supports and Components	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B2.1-a	None	G, 1
Non-ASME Equivalent Supports and Components	SS	Carbon and Low Alloy Steel	Submerged	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Chemistry Control Program (**B.2.1.5**)	III.B2.1-a	None	G, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Non-ASME Equivalent Supports and Components	SS and/or SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	III.B2.1-a	None	F, 3
Non-ASME Equivalent Supports and Components	SS	Non-ferrous - aluminum	Outside Air	None	None	III.B2.1-a	None	F, 3
Non-ASME Equivalent Supports and Components	SS and/or SS(NSR)	Stainless Steel	Containment Atmosphere	None	None	III.B2.1-a	None	F, 3
Non-ASME Equivalent Supports and Components	SS and/or SS(NSR)	Stainless Steel	Inside Air	None	None	III.B2.1-a	None	F, 3
Non-ASME Equivalent Supports and Components	SS	Stainless Steel	Outside Air	None	None	III.B2.1-a	None	F, 3
Pipe Whip Restraints & Jet Impingement Shields	HE/ME Shielding, PW	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B5.1-a	**3.5.1.29**	A
Pipe Whip Restraints & Jet Impingement Shields	PW	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B5.1-a	**3.5.1.29**	A
Pipe Whip Restraints & Jet Impingement Shields	PW	Stainless Steel	Inside Air	None	None	III.B5.1-a	None	F, 3
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.1.4-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.1.4-a	None	G, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.2.3-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS and/or SS(NSR)	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.2.3-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS and/or SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.2.3-a	None	G, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.3.3-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS and/or SS(NSR)	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	**3.5.1.29**	A

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS and/or SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	None	G, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS and/or SS(NSR)	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	None	G, 1
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS	Reinforced Concrete	Containment Atmosphere	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B5.2-a	**3.5.1.29**	A
Reinforced Concrete Beams, Columns, Walls, and Slabs	SS and/or SS(NSR)	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B5.2-a	**3.5.1.29**	A
Stairs, Platforms, Grating Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (**B.2.1.36**)	III.B5.1-a	**3.5.1.29**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Stairs, Platforms, Grating Supports	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B5.1-a	3.5.1.29	A
Stairs, Platforms, Grating Supports	SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.B5.1-a	None	G, 1
Stairs, Platforms, Grating Supports	SS and/or SS(NSR)	Non-ferrous - aluminum	Inside Air	None	None	III.B5.1-a	None	F, 3
Stairs, Platforms, Grating Supports	SS and/or SS(NSR)	Stainless Steel	Containment Atmosphere	None	None	III.B5.1-a	None	F, 3
Supports for Drywell, Torus, and Vent System	SS	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B1.3.1-a	3.5.1.32	E
Supports for Drywell, Torus, and Vent System	SS	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B1.3.1-a	3.5.1.32	E
Supports for Drywell, Torus, and Vent System	SS	Carbon and Low Alloy Steel	Submerged	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Chemistry Control Program (B.2.1.5) One Time Inspection (B.2.1.29)	III.B1.3.1-a	3.5.1.32	E
Trenches	SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (B.2.1.36)	III.B3.2-a	None	G, 1
Tube Track	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Containment Atmosphere	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B2.1-a	3.5.1.29	A
Tube Track	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Inside Air	Loss of material due to general corrosion.	Structures Monitoring Program (B.2.1.36)	III.B2.1-a	3.5.1.29	A
Tube Track	SS and/or SS(NSR)	Carbon and Low Alloy Steel	Outside Air	Loss of material due to crevice corrosion, general corrosion, pitting corrosion.	Structures Monitoring Program (B.2.1.36)	III.B2.1-a	None	G, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.5.2.26: Structures and Component Supports - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging effect requiring management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Tunnels	SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B1.2.3-a	None	G, 1
Tunnels	SS and/or SS(NSR)	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	**3.5.1.29**	A
Tunnels	SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B2.2-a	None	G, 1
Tunnels	SS	Reinforced Concrete	Inside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	**3.5.1.29**	A
Tunnels	SS(NSR)	Reinforced Concrete	Outside Air	Reduction in concrete anchor capacity due to local concrete degradation, service induced cracking or other concrete aging mechanisms.	Structures Monitoring Program (**B.2.1.36**)	III.B3.2-a	None	G, 1

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801."

Note C Component is different, but consistent with NUREG-1801 item for material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note E Consistent with NUREG-1801 item for material, environment, and aging effect, a different aging management program is credited.

Note F Material not in NUREG-1801 item for this component.

Note G Environment not in NUREG-1801 item for this component and material.

Note I Aging effect in NUREG-1801 item for this component, material and environment combination is not applicable.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1 The aging effects and AMP identified for this material/environment combination are consistent with industry guidance.

2 High yield-strength (> 150 ksi) bolting material is not considered susceptible to SCC at BFN. Per EPRI 1002950 (Structural Tools), a periodically wetted environment and the use of thread lubricant containing molybdenum disulfide must be present to initiate SCC in high yield-strength bolting. Since molybdenum disulfide thread lubricants are not used at BFN, SCC of structural bolting will not occur. In addition, there is no BFN operating history of bolting failures due to cracking. Therefore, SCC of structural bolting does not require aging management for the period of extended operation.

3 There are no applicable aging effects for this material/environment combination. This is consistent with industry guidance.

4 Aging management for below grade inaccessible concrete is not required. Reduction of concrete anchor capacity will manifest itself at the anchor locations that are located in the outside air environment. The Structures Monitoring Program will manage reduction of concrete anchor capacity for those portions of the foundations exposed to the outside air environment.

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 component types identified in Section **2.5**, Electrical and Instrumentation and Controls (I&C) Systems, as being subject to aging management review. Since electrical and I&C components were screened using the "spaces approach," system tables are not presented. The Aging Management Review (AMR) results are presented in a single table.

Table **3.6.1**, "Summary of Aging Management Evaluations for Electrical and Instrumentation and Control Systems in Chapter VI of NUREG-1801," provides the summary of the programs evaluated in NUREG-1801 for Electrical and I&C Commodity groups that are relied on for license renewal. This table uses the format described in Section **3.0**. Table 3.6.1 only provides results for those items that are applicable to a boiling water reactor (BWR). NUREG-1800 provides the basis for further evaluation of the license renewal application to complete the summary of aging management evaluations in NUREG-1801 for plant specific considerations. When a further evaluation for Electrical and I&C commodities is recommended by NUREG-1801, that further evaluation is identified in Table 3.6.1 and the evaluation in accordance with the NUREG-1800 basis is provided in Section **3.6.2.2**.

3.6.2 Results

Table **3.6.2.1**, Electrical and Instrumentation and Control Commodities - Summary of Aging Management Evaluation, summarizes the results of the aging management review for Electrical and I&C Commodities.

The materials from which the specific components are fabricated, the environments to which components are exposed, the aging effects requiring management, and the aging management programs used to manage these aging effects are provided for Electrical and I&C Commodities in Section 3.6.2.1, "Materials, Environments, Aging Effects Requiring Management and Aging Management Programs."

3.6.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

Materials

The materials of construction for Electrical and I&C Commodities are:

- Metallic Bus, Transmission Conductors, and High-Voltage Insulator components
- Metallic Electrical Connectors
- Metallic Fuse Clips
- Non-metallic Bus and High-Voltage Insulator components
- Various Organic Polymers (e.g., EPR, SR, EPDM, XLPE)

Environments

Electrical and I&C Commodities are exposed to the following environments:

- Adverse Localized - exposure to heat, radiation, or moisture in the presence of oxygen
- Adverse Localized - exposure to moisture and voltage
- Inside Air
- Outside Air

Aging Effects Requiring Management

The following aging effects associated with Electrical and I&C Commodities require management:

- Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance, electrical failure
- Formation of water trees, localized damage, leading to electrical failure (breakdown of insulation)
- Loosening of phase bus fastening hardware

Aging Management Programs

The following aging management programs manage the aging effects for Electrical and I&C Commodities:

- Accessible Non-EQ Cables and Connections Inspection Program (**B.2.1.1**)
- Bus Inspection Program (**B.2.1.40**)
- Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program (**B.2.1.2**)
- Environmental Qualification (EQ) Program (**B.3.1**)
- Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (**B.2.1.3**)

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 by the reviewer in the license renewal application. For the Electrical and I&C Commodity groups, those programs are addressed in the following section.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification Requirements

Environmental Qualification 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**. The BFN 10 CFR 50.49 Environmental Qualification Program is described in Section **B.3.1**.

3.6.2.2.2 Quality Assurance for Aging Management of Nonsafety-Related Components

See Section **B.1.3** of this application for further discussion.

3.6.2.3 Aging Management Evaluations that Are Different from or Not Addressed in NUREG-1801

The following subsections discuss items that are not addressed in NUREG-1801.

3.6.2.3.1 Identification and Treatment of Electrical Fuse Holders for License Renewal

ISG-05 added NRC guidance for the identification and treatment of electrical fuse holders for license renewal, as follows:

> "Consistent with the requirements specified in 10 CFR 54.4(a), fuse holders (including fuse clips and fuse blocks) are considered to be passive electrical components. Fuse holders would be scoped, screened, and included in the AMR in the same manner as terminal blocks and other types of electrical connections that are currently being treated in the process. This staff position only applies to fuse holders that are not part of a larger assembly, but support safety-related and non safety-related functions in which the failure of a fuse precludes a safety function from being accomplished [10 CFR Part 54.4(a)(1) and (a)(2)]. Examples are fuses that are used as protective devices to ensure the integrity of containment electrical penetrations when they are challenged by electrical faults, or as isolation devices between Class 1E and non-Class 1E electrical circuits to ensure that the safety function is not compromised as a result of faults in the non-Class 1E circuits. An appropriate aging management

program (AMP) should be adopted to manage the effects of aging where necessary."

BFN Evaluation:

BFN has reviewed NUREG-1760 "Aging Assessment of Safety-Related Fuses used in Low- and Medium-Voltage Applications in Nuclear Power Plants," which identifies several potential aging effects/mechanisms of fuse holders that could prevent them from performing their intended function, and could affect their ability to maintain electrical continuity throughout the period of extended operation. BFN evaluated the following aging mechanisms and determined that the only applicable aging mechanism is mechanical stress due to repeated removal and insertion of fuses. This repeated mechanical stress can lead to fatigue, deformation, and loosening of fuse clips to the point where the fuse no longer fits snug into the clip and electrical continuity is lost. NUREG-1760 addresses several industry events involving fuses and holders. A majority of these events were related to the fuse, not the fuse holder. This report concludes that fuse related failures are an infrequent occurrence in the industry and suggests that age-related fuse failures are currently being controlled.

The following are aging effects evaluations for fuse holders at BFN:

- Oxidation, Corrosion of Connecting Surfaces / Moisture or Chemical Contamination:

  Moisture or chemical contamination are potential aging mechanisms causing corrosion of the fuse holder clips and fingers, which could lead to higher resistance and heat buildup. Corrosion or oxidation of the connecting surfaces can increase the electrical resistance of the conductive path. As the condition deteriorates, the increased ohmic heating can lead to heat-related problems with the fuse holder and eventual degradation to the point of failure.

  The fuse holders identified subject to an AMR are manufactured by Bussman and Shawmut. The clips of these fuse holders are constructed of copper and copper alloys plated with a corrosion resistant material (usually tin) to protect the base metal from oxidation. Tin-plating is used extensively in the industry to protect both ferrous and non-ferrous metals from corrosion. Review of plant operating experience revealed no instances of moisture intrusion or corrosion of fuse clips/terminations.

  Plant installation and maintenance practices provide appropriate protection for fuse holders from moisture intrusion (such as in enclosures). The "Location of Major Assembly" field within the BFN Master Equipment List (MEL) EMPAC database was reviewed to identify fuse holders installed outside of an active device, junction box, or similar type enclosures (i.e. unprotected environment). This review identified no unprotected fuses. Boric acid chemical contamination is not of concern for boiling water reactors and therefore in not an applicable stressor at BFN.

Fuse holders are protected by their location within a controlled environment. Therefore, oxidation/corrosion of connecting surfaces due to exposure to moisture or chemical contamination is not an aging effect requiring management.

- Loosening of Connection / Thermal Cycling:

  Thermal cycling is a potential aging mechanism that may cause fuse clips or fingers to become annealed and lose their spring force after just one overheating due to a high resistance connection. Annealing of a copper fuse clip may occur at temperatures as low as 93°C, depending on the degree of cold work.

  Fuse holders in use at BFN are designed to withstand the ratings of the fuses they house. Thus fuse holders are protected from thermal cycling by their design which prevents the aging effect of fuse clip/finger loosening and requires no aging management program.

- Wear, Fatigue, Loosening of Connection / Vibration:

  Vibration is a potential aging mechanism which could lead to wear, fatigue, and loosening of the fuse clip and/or the wiring connections to the fuse holder. Vibration is induced in fuse holders by the operation of external equipment, such as rotating machinery and various other types of equipment that produce considerable amounts of vibration during normal operation. Fuse holders are mounted in their own support structure separated from sources of vibration. Therefore, vibration is not a concern for fuse holders at BFN and an aging management program is not required.

- Fatigue, Deformation, Loosening of Connection / Mechanical Stresses:

  Using the methodology described in Section **2.1.8.5**, BFN performed an aging management review on fuse holders. The AMR concluded that the aging effect of mechanical stress leading to loss of electrical continuity due to fatigue, deformation, and loosening of connection for fuse clips was not present. The results of each step of that AMR evaluation are summarized as follows:

Description of Electronic Step	**Number of Fuses (approximate)**	**Percentage**
Total number of fuses	16302	100%
Fuses in active devices	13366	82%
Fuses not within an in-scope system	2434	15%
Fuses requiring further evaluation	502	3%

Description of Steps for Fuses Requiring Further Evaluation	Number of Fuses (approximate)	Percentage
Fuses requiring further evaluation	502	100%
Fuses which have been deleted, spared, abandoned, etc.	34	7%
Fuses on a panel with active components	139	28%
Fuses without applicable safety or quality code classification	200	40%
Fuses potentially subject to fatigue, deformation, loosening of connection due to mechanical stresses	129	26%

The 129 fuse holders were individually evaluated to determine whether or not they contain fuses that are routinely pulled[1] as an electrical isolation device for their associated circuits for which they provide over-current protection. That evaluation determined that, since 11/01/99, only 14 fuses in the population of 129 have been pulled. Of these 14, 11 have only been pulled once. A further review of the associated work orders for the 3 remaining fuses determined that they were pulled no more than 3 times in a relatively short period of time (3 days to 3 months span) to support corrective maintenance and/or troubleshooting efforts.

From this evaluation, BFN concluded that the 129 fuse holders have not had their associated fuses routinely pulled and reinserted potentially causing fatigue of the fuse holder clips. Rather the pulls were event-based to support troubleshooting and/or corrective maintenance activities. Therefore, it can be stated with reasonable assurance that fuse holders at BFN will maintain their intended function through the period of extended operation with no aging management program required.

3.6.2.3.2 Insulated Cables and Connections

Electrical Failure due to Moisture Intrusion

In a report published by the DOE titled SAND96-0344, Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations (DOE Cable AMG), Section 3.7.2.1.3 states that only 3% of all low-voltage connector failures were identified as being caused by moisture intrusion. Based on the total number of reported connector failures in the DOE Cable AMG, moisture intrusion accounted for only 10 failures in all of the operating plants in the United States.

Per report TR-103834-P1-2, “Effects of Moisture on the Life of Power Plant Cables,” EPRI investigated the effects of long-term moisture exposure/immersion on power plant cables. Based on years of operating experience, this report concluded that moisture-induced aging degradation was not an issue for low-voltage cables.

1 A routinely pulled fuse is defined as one that is removed and reinserted at least once every year.

BFN Evaluation:

Plant installation and maintenance practices provide appropriate protection for connectors from moisture (such as connectors in enclosures, connectors covered with Raychem tubing/splices or tape, etc). Therefore, aging effects related to moisture intrusion for low-voltage cables and connectors do not require aging management for the period of extended operation. However, this aging effect/mechanism is prevalent in medium-voltage cables (i.e. water treeing) and will be managed by the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements program (**B.2.1.3**).

3.6.2.3.3 High-Voltage Insulators

Surface Contamination due to Airborne Contaminates

Various airborne materials such as dust, salt, and industrial effluents can contaminate high-voltage insulator surfaces. The buildup of surface contamination is gradual and in most areas such contamination is washed away by rain. The insulator's glazed surface aids in contamination removal thus minimizing buildup. A large buildup of contamination enables the conductor voltage to track along the surface more easily and can lead to insulator flashover. Surface contamination can be a problem in areas where there are greater concentrations of airborne particles such as near facilities that discharge soot or near the sea coast where salt spray is prevalent.

BFN Evaluation:

BFN is located in an area with moderate rainfall where airborne particle concentrations are comparatively low. Contamination buildup on insulators is not a problem due to rainfall periodically washing the insulators. Consequently, the rate of contamination buildup on high-voltage insulators in not significant. Also, there is no salt spray at BFN since the plant is not located near the ocean. Therefore, surface contamination of high-voltage insulators is not an aging effect requiring management.

Cracking / Cement Growth

Porcelain is essentially a hardened, opaque glass. As with any glass, if subjected to enough force it will crack or break. The most common cause for cracking or breaking of an insulator is being struck by an object (e.g., a rock or bullet). Cracking and breaking caused by physical damage is not an aging effect and is not subject to an AMR.

Cracks have also been known to occur with insulators when the cement that binds the parts together expands enough to crack the porcelain. This phenomenon, know as cement growth, is caused by improper manufacturing process or materials which make the cement more susceptible to moisture penetration. Porcelain cracking caused by cement growth has occurred only in isolated bad batches of insulators used in strain applications. The dates of manufacturer and brands of these problem insulators are known.

BFN Evaluation:

A review of plant-specific operating experience revealed no instances of insulator cracking or failure related to cement growth at the BFN switchyard. Therefore, cracking of high-voltage insulators due to cement growth is not an aging effect requiring management for the period of extended operation.

Loss of Material due to Mechanical Wear

Mechanical wear is an aging mechanism for strain and suspension insulators in that they are subject to movement. Movement of the insulators can be caused by wind blowing the supported transmission conductor, causing it to swing from side to side. If this swinging is frequent enough, it could cause wear in the metal contact points of the insulator string and between an insulator and the supporting hardware.

BFN Evaluation:

Although this mechanism is possible, industry experience has shown that transmission conductors do not normally swing and that when they do, due to a substantial wind, they do not continue to swing for very long once the wind has subsided. Wear has not been identified during maintenance activities on BFN insulators. Therefore, loss of material due to mechanical wear of high-voltage insulators is not an aging effect requiring management for the period of extended operation.

3.6.2.3.4 Transmission Conductors

Loss of Conductor Strength / Corrosion

The most prevalent mechanism contributing to loss of conductor strength of an Aluminum Conductor Steel Reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. 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, sulfur dioxide (SO_2) concentration in air, precipitation, fog chemistry, and meteorological conditions. Tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80-year-old ACSR conductor due to corrosion.

There is a set percentage of composite conductor strength established at which a transmission conductor is replaced. As illustrated below, there is ample strength margin to maintain the transmission conductor intended function through the extended period of operation. The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind, and temperature. These requirements are reviewed concerning the specific conductors included in the AMR. The conductors with the smallest ultimate strength margin (4/0 ACSR) will be used as an illustration.

The ultimate strength and the NESC heavy load tension requirements of 4/0 ACSR are 8350 lbs. and 2761 lbs. respectively. The margin between the NESC Heavy Load and the ultimate strength is 5589 lb.; i.e., there is a 67% of ultimate strength margin. The Ontario Hydroelectric study showed a 30% loss of composite conductor strength in an 80-year-old conductor. In the case of the 4/0 ACSR transmission conductors, a 30% loss of ultimate strength would mean that there would still be a 37% ultimate strength margin between what is required by the NESC and the actual conductor strength.

The 4/0 ACSR conductors have the lowest initial design margin of any transmission conductors included in the AMR. This illustrates with reasonable assurance that transmission conductors will have ample strength through the period of extended operation.

Corrosion of ACSR conductors is a very slow acting aging effect that is even slower for rural areas with generally fewer suspended particles and lower SO_2 concentrations in the air than urban areas.

BFN Evaluation:

TVA Transmission/Power Supply personnel perform normal maintenance activities on all portions of the switchyards, including transmission conductors. These maintenance activities have not revealed any aging effects/mechanisms associated with transmission lines to date. In conclusion, there are no applicable aging effects that could cause loss of the intended function of the transmission conductors. Therefore, loss of conductor strength due to corrosion of transmission conductors is not an aging effect requiring management for the period of extended operation.

<u>Loss of Material (Wear) and Fatigue due to Wind Loading Vibration or Sway</u>

Loss of material (wear) and fatigue could occur in components exposed to wind loading. Transmission conductor vibration and sway caused by wind loading may produce mechanical wear as a result of relative motion between components.

BFN Evaluation:

Industry experience has shown that transmission conductors do not normally swing and that when they do, due to substantial wind, they do not continue to swing for very long once the wind has subsided. Therefore, loss of material (wear) and fatigue due to wind loading vibration or sway of transmission conductors are not applicable aging effects requiring management for the period of extended operation.

3.6.2.3.5 Phase and Switchyard Bus

Loosening of bolted bus connection fastening hardware due to cyclic loading of phase bus resulting in thermal expansion and contraction of the bus

BFN Evaluation:

This aging effect is managed by the Bus Inspection Program (**B.2.1.40**).

Embrittlement, cracking, discoloration, melting, or loss of dielectric strength leading to reduced insulation resistance, electrical failure of phase bus due to (Thermal/thermoxidative) degradation of organics caused by heat in the presence of oxygen

BFN Evaluation:

This aging effect is managed by the Bus Inspection Program (**B.2.1.40**).

Embrittlement, cracking, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance, electrical failure of phase bus due to Radiation-induced oxidation, radiolysis and photolysis (UV sensitive materials only) of organics, caused by radiation in the presence of oxygen

Radiation stress results from exposure of organic materials to normal and abnormal environments. Environmental influences that may induce radiation stress on a material may result from general area and/or localized high radiation doses. Elevated radiation doses produce some degree of aging in most organic materials.

BFN Evaluation:

During the scoping process of phase bus, the types of organic and inorganic materials utilized were identified and bounding radiation values were assigned. Materials were evaluated to compare their bounding radiation values to the bounding 60-year normal service radiation dose of the turbine building. The inorganic materials have no bounding radiation values; therefore, no further evaluation is required. All of the organic materials have bounding radiation values exceeding the bounding 60-year normal service radiation dose of the turbine building. Therefore, all materials will perform their intended function through the period of extended operation and no aging management program is required.

Change in Material Properties Leading to Loss of Function for the Part due to Moisture (corrosion)

Cable and termination components are generally fabricated from non-corroding or corrosion-resistant materials, or have non-oxidizing compounds applied to them during assembly. Metals used in cables and terminations vary somewhat, based on their application. Cable conductors are typically copper or aluminum alloys, both of which are somewhat resistant to corrosion under normal power plant environments. However, both materials will oxidize so that a surface oxide layer forms. Termination materials may be fabricated from a variety of different conductive materials (ferrous or nonferrous), and therefore may experience varying rates of corrosion/oxidation. As previously stated, various chemical by-products may also leach from organic cable and termination components under certain circumstances; these chemicals may result in premature corrosion or oxidation of nearby metallic components.

BFN Evaluation:

All fastening hardware and enclosure assembly parts (bolts, washers, nuts, etc.) for phase bus are manufactured of stainless steel. Stainless steel is highly corrosion resistant and after more than 20 years in its service environment, no signs of corrosion or loss of material have been observed. Therefore, loss of material for fastening hardware and enclosure assembly parts is not an applicable aging effect that would lead to a loss of intended function for phase bus for the period of extended operation.

Cracking due to Vibration

Phase bus is connected to static equipment (such as switchgear, transformers, and disconnect switches) that does not normally vibrate. Phase bus is supported by static structural components such as concrete footings and building steel which do not vibrate. Phase bus, in addition to being connected to static equipment, may be connected to the unit generators through flexible connectors.

Switchyard buses are connected to circuit breakers via flexible aluminum conductors that do not vibrate. Also, switchyard bus is supported by insulators and ultimately by static, structural components such as concrete footings and structural steel which do not vibrate.

BFN Evaluation:

Vibration is not an applicable stressor for phase bus, since non-moving and non-vibrating equipment and supports produce no vibration to affect phase bus. Also, flexible connectors prevent generator vibrations from propagating into the rigid phase bus. In conclusion, vibration is not induced into phase bus.

Vibration is not an applicable stressor for switchyard bus, since it is connected to moving/vibrating equipment via flexible aluminum conductors. Any vibration or movement caused by connected equipment is dampened by the flexible conductors. Also, the design process for switchyard bus has engineered methods included in the design to dampen any vibrations that may get induced into the bus. Therefore, cracking due to vibration is not an applicable aging effect for phase or switchyard bus and an aging management program is not required at BFN.

Change in Material Properties Leading to Increased Resistance and Heating due to Connection Surface Oxidation

Aluminum bus, solid and flexible connectors, and ground straps are highly conductive but do not make a good contact surface since pure aluminum exposed to air forms aluminum oxide on the surface, which is nonconductive.

Dissolved oxygen combines with the metal at the surface of the component to form an insoluble metal oxide. These oxide layers may have significantly different electrical and physical properties than the underlying parent metal. For example, metallic electrical bus that oxidizes with a less conductive species may experience higher electrical resistance and therefore result in overheating of the bus and its associated connectors.

BFN Evaluation:

To prevent the formation of aluminum oxide on bolted connection surfaces, the connections have a silver plating and are covered with grease to prevent air from contacting the connection surface. The grease is a consumable item that is applied to the connection surface each time a bolted connection is made, thereby, precluding oxidation of the connection surface and maintaining good conductivity at the bus connections. Therefore, change in material properties leading to increased resistance and heating due to connection surface oxidation of aluminum bus is not an aging effect requiring management for the period of extended operation.

3.6.2.4 Time-Limited Aging Analysis

The TLAAs identified for Electrical and Instrumentation and Control Systems include:

- Environmental Qualification of Electrical Equipment (Section 4.4)

3.6.3 Conclusion

The Electrical and I&C commodities 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 and I&C commodities 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 and I&C commodities will be adequately managed so that there is reasonable assurance that their intended function(s) will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1 Summary of Aging Management Evaluations for Electrical and Instrumentation and Control Systems Evaluated in Chapter VI of NUREG-1801

Item Number	Component	Aging Effect / Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1.1 (F.4)	Electrical equipment subject to 10 CFR 50.49 environmental qualification (EQ) requirements	Degradation due to various aging mechanisms	Environmental qualification of electrical components	Yes, TLAA	See further evaluation of TLAA in Section 4.4. See further evaluation in Section 3.6.2.2.1. See description of AMP in Section B.3.1.
3.6.1.2	Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance (IR); electrical failure caused by thermal/thermoxidative degradation of organics; radiolysis and photolysis (ultraviolet [UV] sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG 1801. See description of AMP in Section B.2.1.1.
3.6.1.3	Electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced IR; electrical failure caused by thermal/thermoxidative degradation of organics; radiation-induced oxidation; moisture intrusion	Aging management program for electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG 1801 with exceptions. See description of AMP in Section B.2.1.2.
3.6.1.4	Inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or direct buried) not subject to 10 CFR 50.49 EQ requirements	Formation of water trees; localized damage leading to electrical failure (breakdown of insulation) caused by moisture intrusion and water trees	Aging management program for inaccessible medium-voltage cables not subject to 10 CFR 50.49 EQ requirements	No	Consistent with NUREG 1801. See description of AMP in Section B.2.1.3.
3.6.1.5	PWR only.				

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table 3.6.2.1: Electrical and Instrumentation and Control Commodities - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Bus and High-Voltage Insulators	INS	Non-metallic portions of phase bus and high-voltage insulators	Inside Air Outside Air	Embrittlement, cracking, melting, discoloration, or loss of dielectric strength leading to reduced insulation resistance, electrical failure of phase bus due to (Thermal/thermoxidative) degradation of organics caused by heat in the presence of oxygen (includes ohmic heating of bus)	Bus Inspection Program (**B.2.1.40**)	None	None	J, 1
Bus, Transmission Conductors, and High-Voltage Insulators (includes fastening hardware for electrical continuity and non-electrical applications such as bus enclosures)	CE, SS	Metallic portions of bus (phase and switchyard), transmission conductors, and high-voltage insulators	Inside Air Outside Air	Loosening of fastening hardware due to cyclic loading of phase bus resulting in thermal expansion and contraction of the bus	Bus Inspection Program (**B.2.1.40**)	None	None	J, 2
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	CE	Various Organic Polymers	Adverse Localized Environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance, electrical failure caused by (Thermal/thermoxidative) degradation of organics caused by heat in the presence of oxygen or Radiation-induced oxidation, radiolysis and photolysis (UV sensitive materials only) of organics, caused by radiation in the presence of oxygen	Accessible Non-EQ Cables and Connections Inspection Program (**B.2.1.1**)	VI.A.1-a	**3.6.1.2**	A, 3, 4

Table 3.6.2.1: Electrical and Instrumentation and Control Commodities - Summary of Aging Management Evaluation

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG -1801 Vol. 2 Item	Table 1 Item	Notes
Electrical cables used in instrumentation circuits not subject to 10 CFR 50.49 EQ Requirements	CE	Various Organic Polymers	Adverse Localized Environment caused by heat, radiation, or moisture in the presence of oxygen	Embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance, electrical failure caused by (Thermal/thermoxidative) degradation of organics caused by heat in the presence of oxygen or Radiation-induced oxidation, radiolysis and photolysis (UV sensitive materials only) of organics, caused by radiation in the presence of oxygen	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program (**B.2.1.2**)	VI.A.1-b	**3.6.1.3**	B, 4
Inaccessible medium-voltage (2kV to 15kV) cables not subject to 10 CFR 50.49 EQ requirements	CE	Various Organic Polymers	Adverse Localized Environment caused by exposure to moisture and voltage	Formation of water trees, localized damage, leading to electrical failure (breakdown of insulation) caused by moisture intrusion, water trees	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program (**B.2.1.3**)	VI.A.1-c	**3.6.1.4**	A
Various Electrical equipment subject to 10 CFR 50.49 EQ requirements (**F.4**)	CE	Various polymeric and metallic materials	Adverse Localized Environment caused by heat, radiation, oxygen, moisture, or voltage	Various degradation/Various mechanisms	None	VI.B.1-a	**3.6.1.1**	A

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

Table Notes:

Industry Standard Notes:

Note A Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP is consistent with NUREG-1801.

Note B Consistent with NUREG-1801 item for component, material, environment, and aging effect. The AMP takes some exceptions to NUREG-1801.

Note J Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant Specific Notes:

1. The Bus Inspection Program (**B.2.1.40**) will manage the aging effect of embrittlement, cracking, melting, discoloration, or loss of dielectric strength leading to reduced insulation resistance, electrical failure of isolated and non-segregated phase bus due to (thermal/thermoxidative) degradation of organics caused by heat in the presence of oxygen for bus insulation. Other non-metallic components in this component type do not have aging effects requiring management for the period of extended operation. See further evaluation in Section **3.6.2.3.5**.
2. The Bus Inspection Program (**B.2.1.40**) will manage the aging effect of loosening of fastening hardware resulting from cyclic loading of isolated and non-segregated phase bus resulting in thermal expansion and contraction of the bus. Other metallic components in this component type do not have aging effects requiring management for the period of extended operation. See further evaluation in Section **3.6.2.3.5**.
3. This component type includes fuse holders, including the base insulating material and the clips.
4. Electrical failure due to moisture intrusion for low-voltage cables and connectors is not an aging effect requiring management. However, this aging effect is an aging effect that will be managed for medium-voltage cables in the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program described in Section **B.2.1.3**.

4.0 TIME-LIMITED AGING ANALYSES

4.1 INTRODUCTION

This chapter presents descriptions of the Time-Limited Aging Analyses (TLAAs) in accordance with 10 CFR 54.21(c). The chapter is divided into sections, each containing a number of TLAAs in a common general category:

- Neutron Embrittlement of the Reactor Vessel and Internals
- Metal Fatigue
- Environmental Qualification of Electrical Equipment
- Loss of Prestress in Concrete Containment Tendons
- Primary Containment Fatigue
- Other Plant-Specific TLAA

Also, NUREG-1801 identifies numerous aging effects that require evaluation as possible TLAAs. Each of the aging effects that are applicable to Browns Ferry Nuclear Plant (BFN) and that require evaluation as possible TLAAs are identified in Section **3.0** of this LRA and referenced to the appropriate TLAA section.

4.1.1 Identification and Disposition of Time-Limited Aging Analyses

The scope and methods used for the identification and disposition of TLAAs are consistent with those discussed in NUREG-1800 and NEI 95-10.

An analysis, calculation, or evaluation is a TLAA only if it meets all six of the criteria defined in 10 CFR 54.3(a). These six criteria are that an analysis, calculation, or evaluation:

(1) Involves systems, structures, and components within the scope of license renewal, as delineated in 10 CFR 54.4(a);

(2) Considers the effects of aging;

(3) Involves time-limited assumptions defined by the current operating term, for example, 40 years;

(4) Were determined to be relevant by the licensee in making a safety determination;

(5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in 10 CFR 54.4(b); and

(6) Are contained or incorporated by reference in the CLB.

A list of potential generic TLAAs was assembled from industry guidance and experience, including:

- NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants
- NEI 95-10, Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule
- Prior BWR license renewal applications.

The BFN CLB was searched to identify the need for plant-specific TLAAs and to identify any unit-specific TLAAs. The CLB search included the following documents:

- Updated Final Safety Analysis Report (UFSAR)
- Operating Licenses and License Conditions
- Technical Specifications
- Technical Requirements Manuals
- Safety Evaluation Reports
- BFN Licensing Correspondence
- Licensing basis program documents, such as the inservice inspection (ISI) and EQ.

In addition to searching the BFN current licensing basis documents, BFN calculations were searched to identify potential TLAAs. The search of the licensing basis documents along with the search of the calculations ensured that potential TLAAs were identified.

The resulting list of potential TLAAs was reviewed (screened) against the six 10 CFR 54.3(a) criteria with the aid of supporting documents, such as:

- Environmental Qualification Documentation Packages
- ISI reports (ASME XI Summaries of Reportable Indications)
- Design Basis Documents
- Drawings
- Specifications
- Calculations
- Plant Unique Analysis Report (PUAR)
- Procedures
- Supporting databases.

10 CFR 54.21(c) requires that these TLAAs demonstrate that:

(i) The analyses remain valid for the period of extended operation;

(ii) The analyses have been projected to the end of the period of extended operation; or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Each TLAA was dispositioned by one of these three methods.

4.1.2 Identification and Disposition of Exemptions

10 CFR 54.21(c)(2) requires:

A list must be provided of plant specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in 10 CFR 54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

Each 10 CFR 50.12 exemption in effect has been reviewed to determine whether the exemption is based on a TLAA. The results of the evaluation of exemptions are discussed in Section **4.8**.

4.1.3 Summary of Results

Six categories of TLAAs applicable to BFN are identified in Sections 4.2 through 4.7, with their dispositions. A summary is presented in Table 4.1.1. The table includes a reference to the applicable section that discusses the TLAA.

Table 4.1.1 List of Time-Limited Aging Analyses

TLAA Category	Description	Disposition Category	Section
1.	Neutron Embrittlement of the Reactor Vessel and Internals		4.2
	Reactor Vessel Materials Upper-Shelf Energy Reduction Due to Neutron Embrittlement	10 CFR 54.21(c)(1)(ii)	4.2.1
	Adjusted Reference Temperature for Reactor Vessel Materials Due to Neutron Embrittlement	10 CFR 54.21(c)(1)(ii)	4.2.2
	Reflood Thermal Shock Analysis of the Reactor Vessel	10 CFR 54.21(c)(1)(i)	4.2.3
	Reflood Thermal Shock Analysis of the Reactor Vessel Core Shroud	10 CFR 54.21(c)(1)(i)	4.2.4
	Reactor Vessel Thermal Limit Analyses: Operating Pressure – Temperature Limits	10 CFR 54.21(c)(1)(ii)	4.2.5
	Reactor Vessel Circumferential Weld Examination Relief	10 CFR 54.21(c)(1)(ii)	4.2.6
	Reactor Vessel Axial Weld Failure Probability	10 CFR 54.21(c)(1)(ii)	4.2.7
2.	Metal Fatigue		4.3
	Reactor Vessel Fatigue Analyses	10 CFR 54.21(c)(1)(ii) and 10 CFR 54.21(c)(1)(iii)	4.3.1
	Fatigue Analysis of Reactor Vessel Internals	10 CFR 54.21(c)(1)(i) 10 CFR 54.21(c)(1)(ii) and 10 CFR 54.21(c)(1)(iii)	4.3.2
	Piping and Component Fatigue Analysis	10 CFR 54.21(c)(1)(i)	4.3.3
	Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)	10 CFR 54.21(c)(1)(iii)	4.3.4
3.	Environmental Qualification of Electrical Equipment	10 CFR 54.21(c)(1)(iii)	4.4

Table 4.1.1 List of Time-Limited Aging Analyses

TLAA Category	Description	Disposition Category	Section
4.	Loss of Prestress in Concrete Containment Tendons	Not applicable due to the BFN containment design.	4.5
5.	Primary Containment Fatigue		4.6
	Fatigue of Suppression Chamber, Vents, and Downcomers	10 CFR 54.21(c)(1)(iii)	4.6.1
	Fatigue of Torus Attached Pipe and Safety Relief Valve Discharge Lines	10 CFR 54.21(c)(1)(i)	4.6.2
	Fatigue of Vent Line and Process Penetration Bellows	10 CFR 54.21(c)(1)(i)	4.6.3
6.	Other Plant-Specific Time-Limited Aging Analyses		4.7
	Reactor Building Crane Load Cycles	10 CFR 54.21(c)(1)(i)	4.7.1
	Corrosion - Flow Reduction	10 CFR 54.21(c)(1)(iii)	4.7.2
	Dose to Seal Rings for the High Pressure Coolant Injection and Reactor Core Isolation Cooling Containment Isolation Check Valves	10 CFR 54.21(c)(1)(ii)	4.7.3
	Radiation Degradation of Drywell Expansion Gap Foam	10 CFR 54.21(c)(1)(i)	4.7.4
	Corrosion - Minimum Wall Thickness	10 CFR 54.21(c)(1)(iii)	4.7.5
	Irradiation Assisted Stress Corrosion Cracking of Reactor Vessel Internals	10 CFR 54.21(c)(1)(iii)	4.7.6
	Stress Relaxation of Core Plate Hold-Down Bolts	10 CFR 54.21(c)(1)(ii)	4.7.7
	Emergency Equipment Cooling Water Weld Flaw Evaluation	10 CFR 54.21(c)(1)(i)	4.7.8

4.2 NEUTRON EMBRITTLEMENT OF REACTOR VESSEL AND INTERNALS

The materials of the reactor vessel and internals are subject to embrittlement due to high energy (E>1 MeV) neutron exposure. Embrittlement means the material has lower toughness (i.e., will absorb less strain energy during a crack or rupture), thus allowing a crack to propagate more easily under thermal and/or pressure loading.

Toughness (indirectly measured in foot-pounds of absorbed energy in a Charpy impact test) is temperature dependent in ferritic materials. An initial nil-ductility reference temperature (RT_{NDT} - the temperature associated with the transition from ductile to brittle behavior) is determined for vessel materials through a combination of Charpy and drop weight testing. Toughness increases with temperature up to a maximum value called the “upper-shelf energy” (USE). Neutron embrittlement causes an increase in the RT_{NDT} and a decrease in the USE of reactor vessel steels. The increase or shift in the initial nil-ductility reference temperature (ΔRT_{NDT}) as a function of neutron radiation exposure (fluence) means higher temperatures are required for the material to continue to act in a ductile manner.

To reduce the potential for brittle fracture during vessel operation by accounting for the changes in material toughness as a function of fluence, operating pressure-temperature (P-T) limit curves are included in the Technical Specifications. Based on the projected drop in toughness for a given fluence, the P-T curves are generated to provide a minimum temperature limit associated with the vessel pressure. The P-T curves are determined by the RT_{NDT} and ΔRT_{NDT} values for the licensed operating period along with appropriate margins.

The reactor vessel ΔRT_{NDT} and USE, calculated on the basis of neutron fluence, are part of the licensing basis, consider the effects of aging, involved time-limited assumptions for the current operating term, provide conclusion related to the capability of the system and support safety determinations. Therefore, these calculations are TLAAs. The increases in RT_{NDT} (ΔRT_{NDT}) affect the bases for relief from circumferential weld inspection and its associated supporting calculation of limiting axial weld conditional failure probability. As such, circumferential weld examination relief and axial weld failure probability are also TLAAs. Section 4.2 includes the following TLAA discussions related to the issue of neutron embrittlement:

- Reactor Vessel Materials Upper-Shelf Energy Reduction due to Neutron Embrittlement
- Adjusted Reference Temperature for Reactor Vessel Materials due to Neutron Embrittlement
- Reflood Thermal Shock Analysis of the Reactor Vessel
- Reflood Thermal Shock Analysis of the Reactor Vessel Core Shroud

- Reactor Vessel Thermal Limit Analysis: Operating Pressure–Temperature Limits
- Reactor Vessel Circumferential Weld Examination Relief
- Reactor Vessel Axial Weld Failure Probability

4.2.1 Reactor Vessel Materials Upper-Shelf Energy Reduction due to Neutron Embrittlement

Summary Description

Upper-shelf energy is the standard industry parameter used to indicate the maximum toughness of a material at high temperature. 10 CFR 50 Appendix G requires the predicted end-of-life (EOL) Charpy impact test USE for reactor vessel materials to be at least 50 ft-lb (absorbed energy), unless an approved analysis supports a lower value. Initial unirradiated test data are not available for the reactor vessels to demonstrate a minimum 50 ft-lb USE by standard methods. Therefore, end-of-life fracture energy was evaluated by using the equivalent margin analysis (EMA) methodology described in NEDO-32205-A[1]. This analysis confirmed that an adequate margin of safety against fracture, equivalent to 10 CFR 50 Appendix G requirements, does exist. The end-of-life upper-shelf energy calculations satisfy the criteria of 10 CFR 54.3(a). As such, these calculations are a TLAA.

Analysis

The reactor vessels were designed for a 40-year life with an assumed neutron exposure of less than 10^{19} n/cm^2 from energies exceeding 1 MeV. The current licensing basis calculations use realistic calculated fluences that are lower than this limiting value. The design basis value of 10^{19} n/cm^2 bounds calculated fluences for the original 40-year term for all three units.

The tests performed on reactor vessel materials provided limited Charpy impact data. It was not possible to develop original Charpy impact test USE values using the methods of 10 CFR 50 Appendix H and ASTM E185 invoked by 10 CFR 50 Appendix G. Therefore, alternative methods approved by the NRC in NEDO-32205-A were used to demonstrate compliance with the 40-year 50 ft-lb USE requirement.

1 GENE NEDO-32205-A, “10 CFR 50 Appendix C Equivalent Margin Analysis for Low Upper-Shelf Energy in BWR-2 Through BWR-6 Vessels," February 1994 was approved by the NRC as documented in letter (Accession No 94038280161) L.A. England (BWR Owners’ Group) to Daniel G. McDonald (USNRC), “BWR Owners’ Group Topical Report on Upper Shelf Energy Equivalent Margin Analysis – Approved Version”, BWROG-94037, March 21, 1994.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

Fluences were calculated for the reactor vessels for the extended 60-year (54 EFPY (Effective Full-Power Year), for Unit 1; 52 EFPY for Units 2 and 3) licensed operating periods, using the methodology of NEDC-32983P, "General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation."[2] One bounding fluence calculation was performed for Units 1, 2 and 3. Peak fluences were calculated at the vessel inner surface (inner diameter), for purposes of evaluating USE. The value of neutron fluence was also calculated for the 1/4T location into the vessel wall measured radially from the inside diameter using Equation 3 from Paragraph 1.1 of Regulatory Guide 1.99, Revision 2. This 1/4T depth is recommended in the ASME Boiler and Pressure Vessel Code Section XI, Appendix G Sub-article G-2120 as the maximum postulated defect depth.

The end-of-life USE was evaluated by an equivalent margin analysis using the 54 EFPY calculated fluence for Unit 1 and the 52 EFPY calculated fluence for Units 2 and 3. As described in the SER to Boiling Water Reactor Vessel and Internals Project (BWRVIP-74-A)[3], the percent reduction in USE for the limiting BWR/3-6 plates and BWR/2-6 welds are 23.5% and 39% respectively. LRA summary Tables 4.2.1.1 through 4.2.1.6 provide results of the equivalent margin analysis for limiting welds and plates on the three BFN reactor vessels. The results show that the limiting USE EMA percent is less than the BWRVIP-74-A EMA percent acceptance criterion in all cases, and is therefore acceptable.

2 Approved by the NRC in letter, S.A. Richard, USNRC to J.F. Klapproth, GE-NE, "Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation (TAC No. MA9891)", MFN 01-050, September 14, 2001.

3 NRC letter (Accession No. ML012920549) to BWRVIP, "Acceptance Criteria for Referencing of EPRI Proprietary Report TR-113596, 'BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Inspection and Flaw Evaluation Guidelines (BWRVIP-74)' and Appendix A, 'Demonstration of Compliance with the Technical Information Requirements of the License Renewal rule (10 CFR 54.21)," October 18, 2001

Table 4.2.1.1: Equivalent Margin Analysis for BFN Unit 1 Plate Material

BWR/3-6 PLATE
Surveillance Plate USE: %Cu = N/A 1st Capsule Fluence = N/A 2nd Capsule Fluence = N/A 1st Capsule Measured % Decrease = N/A (Charpy Curves) 2nd Capsule Measured % Decrease = N/A (Charpy Curves) 1st Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2) 2nd Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2)
Limiting Beltline Plate USE: %Cu = 0.15 54 EFPY 1/4T Fluence = 1.33E+18 n/cm^2 RG 1.99 Predicted % Decrease = 15.5% (RG 1.99, Figure 2) Adjusted % Decrease = N/A (RG 1.99, Position 2.2)
15.5% $\leq$ 23.5%, so vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

Table 4.2.1.2: Equivalent Margin Analysis for BFN Unit 1 Weld Material

BWR/2-6 WELD
Surveillance Weld USE: %Cu = N/A 1st Capsule Fluence = N/A 2nd Capsule Fluence = N/A 1st Capsule Measured % Decrease = N/A (Charpy Curves) 2nd Capsule Measured % Decrease = N/A (Charpy Curves) 1st Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2) 2nd Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2)
Limiting Beltline Weld USE: %Cu = 0.27 54 EFPY 1/4T Fluence = 1.33E+18 n/cm^2 RG 1.99 Predicted % Decrease = 26.5% (RG 1.99, Figure 2) Adjusted % Decrease = N/A (RG 1.99, Position 2.2)
26.5% $\leq$ 39%, so vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.

Table 4.2.1.3: Equivalent Margin Analysis for BFN Unit 2 Plate Material

BWR/3-6 PLATE
Surveillance Plate USE: %Cu = 0.14 1st Capsule Fluence* = 1.52 $x10^{17}$ n/cm^2 2nd Capsule Fluence = N/A 1st Capsule Measured % Decrease = 4 (Charpy Curves) 2nd Capsule Measured % Decrease = N/A (Charpy Curves) 1st Capsule RG 1.99 Predicted % Decrease = 9 (RG 1.99, Figure 2) 2nd Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2)
Limiting Beltline Plate USE: %Cu = 0.17 52 EFPY 1/4T Fluence = 1.6 E+18 n/cm^2 RG 1.99 Predicted % Decrease = 17% (RG 1.99, Figure 2) Adjusted % Decrease = N/A * (RG 1.99, Position 2.2)
17% $\leq$ 23.5%, so vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

* As described in RG1.99 Position 2.2, surveillance capsule results can be used to modify the USE calculation. Because only one capsule has been removed from BFN Unit 2 at this time, no adjustment was performed.

Table 4.2.1.4: Equivalent Margin Analysis for BFN Unit 2 Weld Material

BWR/2-6 WELD
Surveillance Weld USE: %Cu = 0.20 1st Capsule Fluence* = 1.52 x 10^{17} n/cm^2 2nd Capsule Fluence = N/A 1st Capsule Measured % Decrease = - 3 (increase) (Charpy Curves) 2nd Capsule Measured % Decrease = N/A (Charpy Curves) 1st Capsule RG 1.99 Predicted % Decrease = 13 (RG 1.99, Figure 2) 2nd Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2)
Limiting Beltline Weld USE: %Cu = 0.24 52 EFPY 1/4T Fluence = 1.6E+18 n/cm^2 RG 1.99 Predicted % Decrease = 25.5% (RG 1.99, Figure 2) Adjusted % Decrease = N/A * (RG 1.99, Position 2.2)
25.5% $\leq$ 39%, so vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.

* As described in RG1.99 Position 2.2, surveillance capsule results can be used to modify the USE calculation. Because only one capsule has been removed from BFN Unit 2 at this time, no adjustment was performed.

Table 4.2.1.5: Equivalent Margin Analysis for BFN Unit 3 Plate Material

BWR/3-6 PLATE
Surveillance Plate USE: %Cu = N/A 1st Capsule Fluence = N/A 2nd Capsule Fluence = N/A 1st Capsule Measured % Decrease = N/A (Charpy Curves) 2nd Capsule Measured % Decrease = N/A (Charpy Curves) 1st Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2) 2nd Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2)
Limiting Beltline Plate USE: %Cu = 0.15 52 EFPY 1/4T Fluence = 1.6E+18 n/cm^2 RG 1.99 Predicted % Decrease = 16% (RG 1.99, Figure 2) Adjusted % Decrease = N/A (RG 1.99, Position 2.2)
16% $\leq$ 23.5%, so vessel plates are bounded by the BWRVIP-74-A equivalent margin analysis.

Table 4.2.1.6: Equivalent Margin Analysis for BFN Unit 3 Weld Material

BWR/2-6 WELD
Surveillance Weld USE: %Cu = N/A 1st Capsule Fluence = N/A 2nd Capsule Fluence = N/A 1st Capsule Measured % Decrease = N/A (Charpy Curves) 2nd Capsule Measured % Decrease = N/A (Charpy Curves) 1st Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2) 2nd Capsule RG 1.99 Predicted % Decrease = N/A (RG 1.99, Figure 2)
Limiting Beltline Weld USE: %Cu = 0.24 52 EFPY 1/4T Fluence = 1.6E+18 n/cm^2 RG 1.99 Predicted % Decrease = 25.5% (RG 1.99, Figure 2) Adjusted % Decrease = N/A (RG 1.99, Position 2.2)
25.5% $\leq$ 39%, so vessel welds are bounded by the BWRVIP-74-A equivalent margin analysis.

4.2.2 Adjusted Reference Temperature for Reactor Vessel Materials due to Neutron Embrittlement

Summary Description

The initial RT_{NDT}, nil-ductility reference temperature, is the temperature at which a non-irradiated metal (ferritic steel) changes its fracture characteristics from ductile to brittle behavior. The RT_{NDT} was evaluated according to the procedures in the ASME Code, Paragraph NB-2331. Neutron embrittlement raises the initial nil-ductility reference temperature. 10 CFR 50 Appendix G defines the fracture toughness requirements for the life of the vessel. The shift to the initial nil-ductility reference temperature (ΔRT_{NDT}) is evaluated as the difference in the 30 ft-lb index temperatures from the average Charpy curves measured before and after irradiation. This increase (ΔRT_{NDT}) means that higher temperatures are required for the material to continue to act in a ductile manner. The adjusted reference temperature (ART) is defined as RT_{NDT} + ΔRT_{NDT} + margin. The margin is defined in Regulatory Guide 1.99, Revision 2. The P-T curves are developed from the ARTs for the vessel materials. These are determined by the unirradiated RT_{NDT} and by the ΔRT_{NDT} calculations for the licensed operating period. Regulatory Guide 1.99 defines the calculation methods for ΔRT_{NDT}, ART, and end-of-life USE.

The ΔRT_{NDT} and ART calculations meet the criteria of 10 CFR 54.3(a). As such, they are TLAAs.

Analysis

As described in UFSAR Section **4.2**, the reactor vessels were designed for a 40-year life with an assumed neutron exposure of less than 10^{19} n/cm^2 from energies exceeding 1 MeV. The current licensing basis calculations use realistic calculated fluences that are lower than this limiting value. The design basis value of 10^{19} n/cm^2 bounds calculated fluences for the original 40-year term for all three units. The ΔRT_{NDT} values were determined using the embrittlement correlations defined in Regulatory Guide 1.99, Revision 2.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

Fluences were calculated for the reactor vessels for the extended 60-year (54 EFPY for (Unit 1); 52 EFPY for Units 2 and 3) licensed operating periods using the methodology of NEDC-32983P, "General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation".[4] One bounding calculation was performed for the three BFN reactor vessels. Peak fluences were calculated at the vessel inner surface (inner diameter), for purposes of evaluating USE and ART. The value of neutron fluence was also calculated for

4 Approved by the NRC in letter, S.A. Richard USNRC to J.F. Klapproth, GE-NE, "Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation (TAC No. MA9891)", MFN 01-050, September 14, 2001.

the 1/4T location into the vessel wall measured radially from the inside diameter using Equation 3 from Paragraph 1.1 of Regulatory Guide 1.99, Revision 2. This 1/4T depth is recommended in the ASME Boiler and Pressure Vessel Code Section XI, Appendix G Sub-article G-2120 as the maximum postulated defect depth.

The 54 EFPY (Unit 1) and 52 EFPY (Units 2 and 3) ΔRT_{NDT} for beltline materials were calculated based on the embrittlement correlation found in Regulatory Guide 1.99, Revision 2. The peak fluence, $\Delta RT_{NDT,}$ and ART values for the 60 year (54 EFPY (Unit 1) and 52 EFPY (Units 2 and 3)) license operating period are presented in LRA Table 4.2.2-1. This table shows that the limiting ARTs allow P-T limits that will provide reasonable operational flexibility.

Table 4.2.2.1 60-Year Analysis Results for BFN Units 1, 2 & 3

Parameter	Unit 1 (54 EFPY)	Unit 2 (52 EFPY)	Unit 3 (52 EFPY)
Peak Surface Fluence (n/cm^2)	1.95×10^{18}	2.3×10^{18}	2.3×10^{18}
1/4T Fluence (n/cm^2)	1.35×10^{18}	1.59×10^{18}	1.59×10^{18}
RT_{NDT} (°F)	88	73	73
ART (°F)	167.7	157	157

4.2.3 Reflood Thermal Shock Analysis of the Reactor Vessel

Summary Description

The UFSAR Section 3.3.5 includes an end-of-life thermal shock analysis performed on the reactor vessels for a design basis loss of coolant accident (LOCA) followed by a low-pressure coolant injection. The effects of embrittlement assumed by this thermal shock analysis will change with an increase in the licensed operating period. This analysis satisfies the criteria of 10 CFR 54.3(a). As such, this analysis is a TLAA.

Analysis

For the current operating period, a thermal shock analysis was originally performed on the reactor vessel components. The analysis assumed a design basis LOCA followed by a low-pressure coolant injection accounting for the full effects of neutron embrittlement at the end of the current license term of 40 years. The analysis showed that the total maximum vessel irradiation (1MeV) at the mid-core inside of the vessel to be 2.4×10^{17} n/cm^2 which was below the threshold level of any nil-ductility temperature shift for the vessel material. As a result, it was concluded that the irradiation effects on all locations of the reactor vessels are not limiting. However, this analysis only bounded 40 years of operation.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

The current analysis[5] assumes end-of-life material toughness, which in turn depends on end-of-life ART. The critical location for fracture mechanics analysis is at ¼ of the vessel thickness (from the inside, 1/4T). For this event, the peak stress intensity occurs at approximately 300 seconds after the LOCA.

The analysis shows that at 300 seconds into the thermal shock event, the temperature of the vessel wall at 1.5 inches deep (which is 1/4T) is approximately 400°F. The ART values described in Section 4.2.2 and tabulated in Table 4.2.2.1 list the ARTs for the limiting weld metal of the reactor vessels. The highest calculated reactor vessel beltline material ART value is 167.7°F (Unit 1). Using the equation for K_{IC} presented in Appendix A of ASME Section XI [9] and the maximum ART value, the material reaches upper shelf (a K_{IC} value of 200 ksi√in) at 272°F, which is well below the 400°F 1/4T temperature predicted for the thermal shock event at the time of peak stress intensity. Therefore, the projected analysis is valid for the period of extended operation.

4.2.4 Reflood Thermal Shock Analysis of the Reactor Vessel Core Shroud

Summary Description

Radiation embrittlement may affect the ability of reactor vessel internals, particularly the core shroud, to withstand a low-pressure coolant injection thermal shock transient. The analysis of core shroud strain due to reflood thermal shock is based on the calculated lifetime neutron fluence. This analysis satisfies the criteria of 10 CFR 54.3(a). As such, this analysis is a TLAA.

Analysis

The reactor vessel core shrouds were evaluated for a low-pressure coolant injection reflood thermal shock transient considering the embrittlement effects of 40-year radiation exposure (32 EFPY). The core shrouds receive the maximum irradiation on the inside surface opposite the midpoint of the fuel centerline. The total integrated neutron flux at end of life at inside surface of the shroud is anticipated to be 2.7 x 10^{20} n/cm^2 (greater than 1 MeV). The maximum thermal shock stress in this region will be 155,700 psi equivalent to 0.57% strain. This strain range of 0.57% was calculated at the midpoint of the shroud, the zone of highest neutron irradiation. The calculated strain range of 0.57% represents a considerable margin of safety below measured values of percent elongation for annealed Type 304 stainless steel irradiated to 8 x 10^{21} n/cm^2 (greater than 1 MeV). The measured value of percent elongation for stainless steel weld metal is 4% for a temperature of 297°C (567°F) with a neutron flux of 8 x 10^{21} n/cm^2 (greater than 1 MeV), while the average value for base metal

5 Ranganath, S., "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979, Paper G1/5.

at 290°C (554°F) is 20%.[6] Therefore, thermal shock effects on the shroud at the point of highest irradiation level will not jeopardize the proper functioning of the shroud following the design basis accident during the current licensed operating term of 40 years.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

The reflood thermal shock analysis of the reactor vessel core shroud calculated that the fluence for the most irradiated point on the inner surface of the shroud for the 40-year operating period is below the threshold (3.0×10^{20} n/cm^2) for material property changes due to irradiation. Using the approved fluence methodology discussed in Section 4.2.2, the 54 EFPY fluence at the most irradiated point on the core shroud was calculated to be 5.34×10^{21} n/cm^2 for Unit 1, above the threshold for material property changes due to irradiation. Since the measured value of elongation bounds the calculated thermal shock strain amplitude of 0.57%, the calculated thermal shock strain at the most irradiated location is acceptable considering the embrittlement effects for a 60-year operating period.

4.2.5 Reactor Vessel Thermal Limit Analyses: Operating Pressure-Temperature Limits

Summary Description

The adjusted reference temperature (ART) is the sum of Initial RT_{NDT} + ΔRT_{NDT} + margins for uncertainties at a specific location. Neutron embrittlement increases the ART. Thus, the minimum metal temperature at which a reactor vessel is allowed to be pressurized increases. The ART of the limiting beltline material is used to correct the beltline P-T limits to account for irradiation effects.

The 10 CFR Part 50 Appendix G requires reactor vessel thermal limit analyses to determine operating P-T limits for three categories of operation: 1) hydrostatic pressure tests and leak tests, referred to as Curve A; 2) non-nuclear heat-up / cooldown and low-level physics tests, referred to as Curve B; and 3) core critical operation, referred to as Curve C. Pressure/temperature limits are developed for three vessel regions: the upper vessel region, the core beltline region, and the lower vessel bottom head region.

The calculations associated with generation of the P-T curves satisfy the criteria of 10 CFR 54.3(a). As such, this topic is a TLAA.

6 EPRI TR-108279 (BWRVIP-35), "Fracture Toughness and Tensile Properties of Irradiated Austenitic Stainless Steel Components Removed from Service," June 1997 (EPRI Proprietary Information).

Analysis

The BFN Technical Specifications Section 3.4.9 contains P-T limit curves for heat up, cooldown, criticality, and inservice leakage and hydrostatic testing. Limits are also imposed on the maximum rate of change of reactor coolant temperature. The P-T limit curves are currently[7] calculated for 12 EFPY (Unit 1), 17.2 EFPY (Unit 2) and 13.1 EFPY (Unit 3) operating periods. Because of the relationship between the P-T limits and the fracture toughness transition of the reactor vessel, the three reactor vessels will require new P-T limits to be calculated and approved before the period of extended operation."

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses will be projected to the end of the period of extended operation.

Revised P-T limits will be prepared and submitted to the NRC for approval prior to the start of the extended period of operation.

4.2.6 Reactor Vessel Circumferential Weld Examination Relief

Summary Description

Relief from reactor vessel circumferential weld examination requirements under Generic Letter 98-05 is based on probabilistic assessments that predict an acceptable probability of failure per reactor operating year. The analysis is based on reactor vessel metallurgical conditions as well as flaw indication sizes and frequencies of occurrence that are expected at the end of a licensed operating period.

Units 2 and 3 have received this relief for the remaining 40 year licensed operating period.[8] Unit 1 has not submitted a relief request for the remainder of its 40 year licensed operating period. As such, the supporting evaluations only apply to the Units 2 and 3 reactor vessels. The circumferential weld examination relief analyses meet the requirements of 10 CFR 54.3(a). As such, they are a TLAA.

Analysis

BFN received NRC approval for a technical alternative that eliminated the reactor vessel circumferential shell weld inspections for the current license term. The basis for this relief request was an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license, based on BWRVIP-05 and the

7 The data provided in this section for the P-T curves does not include the BFN submittal (Accession No. ML032750278) to the NRC dated September 18, 2003 titled "Browns Ferry Nuclear Plant (BFN) - Units 2 and 3 - Technical Specifications (TS) Change TS-441 Revision 1 - Update Of Pressure-Temperature (P-T) Curves." This submittal is currently under review by NRC.

8 NRC letter to TVA, "Browns Ferry Nuclear Plant Unit 2, Relief Request 2-ISI-9, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA8424)," August 14, 2000, and NRC letter to TVA, "Browns Ferry Nuclear Plant Unit 3, Relief Request 3-ISI-1, Revision 1, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA5953)," November 18, 1999.

extent of neutron embrittlement. The anticipated changes in metallurgical conditions expected over the extended licensed operating period require an additional analysis for the period of extended operation and approval by the NRC to extend this relief request.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

The NRC evaluation of BWRVIP-05 utilized the FAVOR code to perform a probabilistic fracture mechanics (PFM) analysis to estimate the RPV shell weld failure probabilities.[9] Three key assumptions of the PFM analysis are: 1) the neutron fluence was the estimated end–of-life mean fluence, 2) the chemistry values are mean values based on vessel types, and 3) the potential for beyond-design-basis events is considered. LRA Table 4.2.6.1 provides a comparison of the BFN Units 2 and 3 reactor vessel limiting circumferential weld parameters to those used in the NRC evaluation of BWRVIP-05 for the first two key assumptions. Data provided in LRA Table 4.2.6.1 was supplied from Tables 2.6.4 and 2.6.5 of the Final Safety Evaluation of the BWRVIP-05 Report.

For Units 2 and 3, the fluence is equivalent to the NRC analysis. However, the BFN Units 2 and 3 weld materials have significantly lower copper values (0.09 vs. 0.31) than those used in the NRC analysis. Hence, there is a significantly smaller chemistry factor. As a result, the shifts in reference temperature for Units 2 and 3 are lower than the 64 EFPY shift from the NRC SER analysis. In addition, the unirradiated reference temperatures for both units are significantly lower. The combination of unirradiated reference temperature ($RT_{NDT(U)}$) and shift (ΔRT_{NDT} w/o margin) yields adjusted reference temperatures for Units 2 and 3 that are considerably lower than the NRC mean analysis values.

Therefore, the RPV shell weld embrittlement due to fluence has a negligible effect on the probabilities of RPV shell weld failure. The Mean RT_{NDT} values for Units 2 and 3 at 52 EFPY are bounded by the 64 EFPY Mean RT_{NDT} provided by the NRC. Although a conditional failure probability has not been calculated, the fact that the BFN values at the end of license are less than the 64 EFPY value provided by the NRC leads to the conclusion that the BFN RPV conditional failure probability is bounded by the NRC analysis.

The procedures and training used to limit cold over-pressure events will be the same as those approved by the NRC when BFN requested that the BWRVIP-05 technical alternative be used for the current term for Units 2 and 3.

An extension of this relief for the 60-year period will be submitted to the NRC for approval prior to entering the period of extended operation.

9 NRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, "Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report," (TAC No. M93925), July 28, 1998.

Table 4.2.6.1 Effects of Irradiation on RPV Circumferential Weld Properties - BFN Units 2 & 3 Compared to the NRC SER Evaluation

Group	B&W 64 EFPY	BFN Unit 2 52 EFPY	BFN Unit 3 52 EFPY
Cu%	0.31	0.09	0.09
Ni%	0.59	0.65	0.66
CF	196.7	117	117
Fluence at clad/weld interface (10^{19} n/cm^2)	0.19	0.19	0.19
ΔRT_{NDT} w/o margin (°F)	109.4	65	65
$RT_{NDT(U)}$ (°F)	20	-40	-40
Mean RT_{NDT} (°F)	129.4	25	25
P(F/E) NRC	4.83×10^{-4}	---	---
P(F/E) BWRVIP	---	---	---

4.2.7 Reactor Vessel Axial Weld Failure Probability

This section applies to Units 2 and 3 only.

Summary Description

The Boiling Water Reactor (BWR) Owner's Group Vessel and Internals Program recommendations[10] for inspection of reactor vessel shell welds contain generic analyses supporting an NRC SER[11] conclusion that the generic-plant axial weld failure rate is no more than 5×10^{-6} per reactor year. BWRVIP-05 showed that this axial weld failure rate of 5×10^{-6} per reactor year is orders of magnitude greater than the 40-year end-of-life circumferential weld failure probability, and used this analysis to justify relief from inspection of the circumferential welds as described in Section 4.2.6.

Units 2 and 3 received relief from the circumferential weld inspections for the remainder of their 40 year licensed operating period. Unit 1 has not submitted a relief request for the remainder of its 40 year license operating period. As such, the supporting evaluations only apply to Units 2 and 3. The axial weld failure probability analysis meets the requirements of 10 CFR 54.3(a). As such, it is a TLAA.

10 EPRI Report TR-105697, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05)," September 28, 1995

11 NRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, "Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report," (TAC No. M93925), July 28, 1998.

Analysis

As stated in Section 4.2.6, Units 2 and 3 received NRC approval for a technical alternative which eliminated the reactor vessel circumferential shell weld inspections for the current license term. The basis for this relief request was an analysis that satisfied the limiting conditional failure probability for the circumferential welds at the expiration of the current license based on BWRVIP-05 and the extent of neutron embrittlement. The NRC SER associated with BWRVIP-05 concluded that the reactor vessel failure frequency due to failure of the limiting axial welds in the BWR fleet at the end of 40 years of operation is less than 5×10^{-6} per reactor year. This failure frequency is dependent upon given assumptions of flaw density, distribution, and location. The failure frequency also assumes that "essentially 100%" of the reactor vessel axial welds will be inspected. The anticipated changes in metallurgical conditions expected over the extended licensed operating period require an additional analysis for the period of extended operation and approval by the NRC to extend the reactor vessel circumferential weld inspection relief request.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

Table 4.2.7.1 compares the limiting axial weld 52 EFPY properties for Units 2 and 3 against the values taken from Table 2.6.5 found in the NRC SER for BWRVIP-05 and associated supplement[12] to the SER. The SER supplement required the limiting axial weld to be compared with data found in Table 3 of the document. For Units 2 and 3, the comparison was made to the 'Mod 2' plant information. The supplemental SER stated that the 'Mod 2' calculations most closely match the 5×10^{-6} RPV failure frequency.

The limiting axial welds at BFN Units 2 and 3 are all electroslag welds with similar chemistry. The Units 2 and 3 limiting weld chemistry, chemistry factor, and 52 EFPY mean RT_{NDT} values are within the limits of the values assumed in the analysis performed by the NRC staff in the BWRVIP-05 SER supplement and the 64 EFPY limits and values obtained from Table 2.6.5 of the SER. Therefore, the probability of failure for the axial welds is bounded by the NRC evaluation.

12 NRC letter from Jack R. Strosnider, to Carl Terry, BWRVIP Chairman, "Supplement to Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report," (TAC No. MA3395), March 7, 2000

**Table 4.2.7.1 Effects for Irradiation on RPV Axial Weld Properties
Browns Ferry Nuclear Plant Units 2 & 3**

Value	NRC BWRVIP-05 SER Mod 2	BFN Unit 2 52 EFPY	BFN Unit 3 52 EFPY
Cu%	0.219	0.24	0.24
Ni%	0.996	0.37	0.37
CF	---	141	141
Fluence x 10^{19} (n/cm^2)	0.148*	0.23	0.23
ΔRT_{NDT} (ºF)	116	85	85
$RT_{NDT(U)}$ (ºF)	-2	23	23
Mean RT_{NDT} (ºF)	114	108	108
P(F/E)	5.02 x 10^{-6}	Not Calculated	Not Calculated

*Peak Axial Fluence

4.3 METAL FATIGUE

A cyclically loaded metal component may fail because of fatigue even though the cyclic stresses are considerably less than the static design limit. Some design codes (such as the ASME Boiler and Pressure Vessel Code and the ANSI piping codes) therefore contain explicit metal fatigue calculations or design limits. Cyclic or fatigue design of other components may not be to these codes, but may use similar methods. These analyses, calculations, and designs to cycle count limits or to fatigue usage factor limits may be TLAAs.

BFN Fatigue analyses are presented in the following groupings:

- Reactor Vessel Fatigue Analyses
- Fatigue Analysis of Reactor Vessel Internals
- Piping and Component Fatigue Analysis
- Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)

4.3.1 Reactor Vessel Fatigue Analyses

Summary Description

Reactor vessel fatigue analyses of the vessel support skirt, shell, upper and lower heads, closure flanges, nozzles and penetrations, nozzle safe ends, and closure studs depend on assumed numbers and severity of normal and upset-event pressure and thermal operating cycles to predict end-of-life fatigue usage factors.

These assumed cycle counts and fatigue usage factors are based on 40 years of operation. Calculation of fatigue usage factors is part of the current licensing basis and is used to support safety determinations. The reactor vessel fatigue analyses are TLAAs.

Analysis

The original reactor pressure vessel report included a fatigue analysis for the reactor vessel components based on a set of design basis duty cycles. These duty cycles are listed in Section **4.2.5** of the BFN UFSAR. The original 40-year analyses demonstrated that the cumulative usage factors (CUF) for the critical components would remain below the ASME Code Section III allowable value of 1.0.

TVA has performed an analysis for reactor vessel cumulative fatigue usage factors for the renewal term. A subset of the bounding reactor vessel components was evaluated as a part of this analysis. The resulting fatigue CUFs for these limiting components supersede the values determined in the original reactor vessel analyses.

The original code analysis of the reactor vessel included fatigue analysis of the Feedwater (FW) and control rod drive (CRD) hydraulic system return line nozzles. After several years of operation, it was discovered that both the CRD hydraulic system return line nozzles and the FW nozzles were subject to cracking caused by a number of factors including rapid thermal cycling. Consequently, the CRD hydraulic system return line nozzles were capped and removed from service. As such, they are no longer subject to rapid thermal aging. A reanalysis was later performed on the FW nozzles along with modifications to reduce or eliminate the causes. This revised analysis did not include the effects from rapid thermal cycling as the FW System design and operation is bounded by a generic BWR Owners Group guidance. BFN follows the improved BWR Owners Group inspection and management methods.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation; and 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

For the period of extended operation, the fatigue usage factors for the limiting components have been reevaluated based on bounding conditions. For Unit 1, all CUFs have been projected to be less than the ASME Code allowable for 60 years. For Units 2 and 3, several components have 60-year CUFs greater than the ASME Code allowable of 1.0. The results of the evaluation are shown in Table 4.3.1.1.

Table 4.3.1.1: Fatigue Evaluation Results (Note 1)

Component	Computed Fatigue Usage Factor for 60 years		Included in Fatigue Monitoring Program (B.3.2) (Note 2)
	BFN Unit 1	BFN Units 2 and 3	
Recirculation Outlet Nozzle	0.741	1.17	Y (NUREG/CR-6260 component)
Recirculation Inlet Nozzle	0.35	0.64	Y (NUREG/CR-6260 component)
Feedwater Nozzle	0.752	1.50	Y (NUREG/CR-6260 component)
Core Spray Nozzle	0.03	0.11	Y (NUREG/CR-6260 component)
Support Skirt	0.099	1.36	Y
Closure Stud Bolts	0.863	1.14	Y
Vessel Shell	0.048	0.048	Y (NUREG/CR-6260 component)

Notes:

1. These results do not account for environmental fatigue effects.
2. The components listed as a “NUREG/CR-6260 component” will be monitored for GSI –190. (Section 4.3.4**)**.

4.3.2 Fatigue Analysis of Reactor Vessel Internals

Summary Description

The original fatigue analysis of the reactor internals was performed using the ASME Boiler and Pressure Vessel Code, Section III, as a guide. The method of analysis used to determine the cumulative fatigue usage is described in [8], which determined that the most significant fatigue loading occurs at the jet pump diffuser to baffle plate weld location; this was the only fatigue analysis performed. The original 40 year calculation showed a CUF of 0.35, less than the ASME allowable of 1.0. Since this analysis used a number of cycles for a 40 year life, it is considered a TLAA. In addition, BFN Unit 3 installed a repair at the T-box location to address cracking, as well as a lower sectional replacement in the core spray line. Fatigue calculations were performed for several components using ASME Section III as a guide, since the core spray line is not a ASME Section III component. Since these analyses were based on a 40 year life, they are considered TLAAs.

Analysis

The original fatigue evaluation identified the High Pressure Cooling Injection (HPCI) startup transient as the most severe, as applied to the fatigue usage. The analysis assumed that the reactor internals were instantaneously cooled to a temperature of 300°F while the reactor vessel remained at 550°F. Based on the calculated stresses, the peak strain range location was at the inside surface of the transition piece opposite the ¼-inch radius fillet. The maximum stress intensity was calculated to be 161,000 psi, which converts to a peak strain range of 1.35%.

Once this location was determined, the peak strain for other significant transients was evaluated. The other events analyzed for included: (1) Normal startup and shutdown; (2) Improper start of a recirculation loop; and (3) DBA. Based on the calculated strain ranges for each event, the number of allowable cycles was determined per ASME Section III, compared to the design number of cycles, and the fatigue usage calculated. The 40 year CUF for this location was determined to be 0.35, less than the ASME allowable of 1.0.

For the T-box repair, an explicit fatigue calculation was performed based on a 40-year lifetime. In this calculation, the fatigue usage factor was calculated for normal and upset conditions (service Levels A and B). Included in the basis for this calculation is boundary condition that the core spray piping remains attached to the T-box. The CUF was calculated to be 0.022 for a 40-year lifetime.

The fatigue evaluation of the lower core spray line sectional replacement used the maximum Level AB stress intensity, and included cycles for an OBE event. The number of cycles was based upon a 40-year design life; the maximum reported fatigue usage factor was 0.45.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation; 10 CFR 54.21(c)(1)(ii) - The analyses have been projected to the end of the period of extended operation; and 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Since the original fatigue analysis used a number of cycles for a 40-year design life, the calculation for the jet pump diffuser to baffle plate weld was projected for a 60 year life by multiplying the CUF by 1.5, except for the CUF associated with the DBA transient (0.10). The resultant fatigue usage was calculated to be 0.46, less than the ASME Code allowable of 1.0. Therefore, the projected fatigue usage of the reactor internal components is acceptable for the period of extended operation.

The fatigue calculation for the core spray T-box repair was evaluated for a lifetime of 60 years. The 40-year fatigue usage is multiplied by 1.5, resulting in a 60-year CUF of 0.033. This is less than the ASME Code Limit of 1.0, and is therefore acceptable for the period of extended operation. In addition, the core spray T-box location is inspected as part of the Boiling Water Reactor Vessel Internals Aging Management Program (**B.2.1.12**). These inspections will be used to manage the effects of cracking of the T-box to piping welds, such that the analysis boundary condition (core spray piping attached to the T-box) remains valid.

For the lower sectional replacement, the design life was specified as 40 years. Since the modification was installed more than 20 years into the current license, the fatigue calculations remain valid for the period of extended operation.

4.3.3 Piping and Component Fatigue Analysis

Summary Description

The reactor coolant pressure boundary (RCPB) piping for all three units was designed to USA Standard (USAS) B31.1. The non-RCPB piping in the scope of license renewal was also designed to USAS B31.1. This code did not require fatigue analyses. While USAS B31.1 does not require explicit fatigue analysis it does require selection of a cycle based stress range reduction factor. Therefore, USAS B31.1 pipe stress qualifications are considered TLAAs.

Analysis

The USAS B31.1-1967 is the piping design code for all three units at BFN. This code does not invoke fatigue analysis; however, it does require the application of a stress range reduction factor to the allowable stress range for expansion stresses to account for cyclic thermal conditions. The allowable secondary stress range is $1.0S_A$ for 7,000 or less equivalent full-temperature thermal cycles and is reduced in steps to $0.5S_A$ for greater than 100,000 cycles.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

The analyses remain valid for the period of extended operation.

The assumed thermal cycle count for the analyses associated with B31.1 piping and components can conservatively be approximated by the applicable thermal transients used in the reactor vessel analysis. The design transients for the reactor vessel are listed in UFSAR Section **4.2.5**. The total count of all these listed thermal cycles is less than 1100 for a 40-year plant life. Turndown to 75% and 50% power are neglected in this total count, as these conditions are achieved primarily through flow rate reduction, and have very little impact on process temperatures. For the 60-year extended operating period, the number of thermal cycles for piping analyses would be proportionally increased to less than 1650, a fraction of the 7000-cycles threshold. The existing piping analyses within the scope of license renewal containing the assumed thermal cycle counts are valid for the period of extended operation.

4.3.4 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)

Summary Description

Generic Safety Issue (GSI) 190 was identified by the NRC staff because of concerns about the potential effects of reactor water environments on component fatigue life during the period of extended operation. GSI-190 was closed in December 1999, and concluded that environmental effects have a negligible impact on core damage frequency, and as such, no generic regulatory action is required. However, as part of the closure of GSI-190, the NRC concluded that licensees who apply for license renewal should address the effects of coolant environment on component fatigue life as part of their aging management programs.

Analysis

Plant-specific evaluations were performed for the locations identified in NUREG/CR-6260. For each of these locations, environmental fatigue calculations were performed using the appropriate F_{en} relationships for carbon/low alloy steels from NUREG/CR-6583 and stainless steels from NUREG/CR-5704, as appropriate for the material in each location. The calculations included, where necessary, determination of an appropriate F_{en} factor for each individual load pair in the governing fatigue calculation so that an overall multiplier on CUF for environmental effects was determined for each location.

This evaluation is consistent with the recommendations of NUREG-1800 Section 4.3.2.2 for addressing the effects of the reactor coolant environment by assessing the effects on a sample of critical components.

The results of the plant-specific evaluation are shown in Table 4.3.4.1.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Evaluations for the period of extended operation were performed using the anticipated number of cycles of plant transients for the 60-year period. All necessary plant transient events will be tracked to ensure that the CUF values will remains less than 1.0 for these components using the Fatigue Monitoring Program (**B.3.2**).

For the locations where the CUF is expected to exceed 1.0 for the 60-year period, additional analysis will be performed prior to the period of extended operation and appropriate corrective action will be taken if the projected end-of-life CUF values remain above 1.0.

Table 4.3.4.1 Summary of Environmental Fatigue Calculations for Browns Ferry Nuclear Plant

No.	Component	Material	CUF 40-Year Design	CUF 60-Year*	Overall Environmental Multiplier	Environmental CUF -60-Year
1	Reactor Vessel Shell and Lower Head	SA-302 (Low Alloy Steel)	0.032	0.0003	18.11	0.006
2	Reactor Vessel Feedwater Nozzle	SA-508 (Low Alloy Steel)	0.700	0.095	7.87	0.747
3	Reactor Recirculation Piping	SA-358 Type 304 (Stainless Steel)	0.397	0.791	5.29	4.181
	Reactor Recirculation Outlet Nozzle	SA-508 Class II (Low Alloy Steel)	0.045	0.068	10.85	0.736
	Reactor Recirculation Inlet Nozzle	SA-508 Class II (Low Alloy Steel)	0.206	0.104	7.39	0.768
4	Core Spray Nozzle	Low Alloy Steel	0.073	0.062	16.08	0.994
	Core Spray Nozzle Safe End	Stainless Steel	0.006	0.005	15.35	0.083
5	RHR Return Line Class 1 Piping	SA-358 Type 304 (Stainless Steel)	0.032	0.042	15.35	0.644
6	Feedwater Line Class 1 Piping	SA-106 Grade B (Carbon Steel)	0.427	0.939	1.59	1.489

* The 60-year CUF values were calculated using anticipated cycles and removing analysis conservatisms

4.4 ENVIRONMENTAL QUALIFICATION OF ELECTRICAL EQUIPMENT

Summary Description

The 10 CFR 50.49, "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants", requires that certain electrical and instrument and control equipment located in harsh environments be qualified to perform their safety-related functions in those harsh environments after the effects of inservice aging. The Environmental Qualification (EQ) Program was established to verify that all plant equipment within the scope of 10 CFR 50.49 is qualified for its application and meets its specified performance requirements when subjected to the conditions predicted to be present when it must perform its safety function up to the end of its qualified life.

Analysis

The BFN Environmental Qualification Program (Section **F.4**) is in compliance with the criteria of 10 CFR 50.49.

10 CFR 50.49(e)(5) contains provisions for aging that require, in part, consideration of all significant types of aging degradation that can affect component functional capability. 10 CFR 50.49(e)(5) also requires component replacement or maintenance prior to the end of designated life unless additional life is established through ongoing qualification. 10 CFR 50.49(k) and (l) permit different qualification criteria to apply based on plant vintage. Supplemental EQ regulatory guidance for compliance with these different qualification criteria is provided in the Regulatory Guide 1.89, Revision 1, "Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants," the Division of Operating Reactors (DOR) Guidelines, and NUREG-0588.

All operating nuclear power plants must meet the requirements of 10 CFR 50.49 for certain electrical and I&C components important to safety. 10 CFR 50.49 defines the scope of components to be included and requires the preparation and maintenance of a qualification binder that includes component performance specifications, electrical characteristics, and environmental conditions. Compliance with 10 CFR 50.49 provides evidence that the component will perform its intended functions during and after a design basis accident after experiencing the effects of inservice aging.

The EQ program manages applicable component thermal, radiation, and cyclic aging effects through the aging evaluations based on 10 CFR 50.49 for the current operating license using four methods of demonstrating qualification for aging and accident conditions established by 10 CFR 50.49(f). Maintaining qualification through the extended license renewal period requires that existing EQ evaluations be re-analyzed. A summary of BFN's application of these 10 CFR 50.49(f) methodologies to the EQ evaluations for the period of extended operations follows:

Analytical Methods: The analytical models used in the re-analysis of an aging evaluation will generally be the same as those applied during the initial qualification; but in all cases will be an acceptable methodology. Acceptable calculation methods, such as the Arrhenius methodology, will be used for performing thermal aging evaluations where appropriate. 60 year radiation dose rates will be determined by multiplying the 40 year normal doses by 1.5 or by other acceptable methods. Cyclical aging will be re-evaluated for those components subject to this effect.

Data Collection and Reduction Methods: Reducing excess conservatism in the service conditions used in the aging evaluation is one method that can be used in a re-analysis. Evaluations based on actual plant temperature data will, in certain cases, yield desired results for extended service life. Should BFN opt to use this approach, plant temperature data can be obtained in several ways; including plant monitors, measurements taken by plant personnel, and temperature sensors on various plant equipment. Similar methods of reducing excess conservatism in the component service conditions may be also be used for radiation and cyclical aging.

Underlying Assumptions: Environmental excursions identified during plant operation or maintenance activities which could affect the qualification of an EQ component will be evaluated. Should unexpected adverse conditions be identified, the affected EQ component is evaluated and appropriate corrective actions taken, which may include changes to the qualification basis and conclusions reached, or restructuring of the affected components EQ requirements.

Acceptance Criteria and Corrective Actions: If the qualification cannot be extended by re-analysis using the above methodologies, the component will be refurbished, replaced, or re-qualified prior to exceeding the period for which the current qualification remains valid.

The 10 CFR 50.49 Environmental Qualification Program is consistent with the guidance provided for resolution in the NRC Regulatory Issue Summary 2003-09[13] (Accession No. ML031220078), “Environmental Qualification of Low-Voltage Instrumentation and Control Cables,” in which the NRC states:

> "For license renewal, a re-analysis (based on the Arrhenius methodology) to extend the life of the cables by using the available margin based on a knowledge of the actual operating environment compared to the qualification environment, coupled with observations of the condition of the cables during walk-downs, was found to be an acceptable approach. Monitoring I&C cable condition could provide the basis for extending cable life.”

13 This issue had formerly been identified as GSI-168, “Environmental Qualification of Low Voltage Instrumentation & Control Cables.”

The Environment Qualification program allows re-analysis for maintaining qualification using the methods described above. In addition, the EQ program has procedural requirements in place to monitor and track aging affects. There are requirements for:

- Detecting degradation of materials or equipment performance by requiring preventive maintenance and periodic surveillance
- Failure trend evaluations related to equipment and environments
- Notification of environmental excursions and subsequent evaluation of components
- Review of licensing, industry, and other generic industry operating experience.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The existing EQ program will be continued for the extended operating period. Continuing the existing EQ program provides reasonable assurance that the aging effects will be managed and that the EQ components will continue to perform their intended functions for the period of extended operation. Refer to Section **B.3.1**, Environmental Qualification Program for additional details regarding the consistency of the BFN Environmental Qualification program with the NUREG-1801 Vol. 2 Chapter X.E.1 program attribute evaluation.

4.5 LOSS OF PRESTRESS IN CONCRETE CONTAINMENT TENDONS

The BFN containments do not have prestressed tendons. As such, this topic is not a TLAA for BFN.

4.6 PRIMARY CONTAINMENT FATIGUE

The primary containment vessels for BFN Units 1 and 2 were designed in accordance with the ASME Code Section III 1965 Edition with addenda up through Winter 1966. The primary containment vessel for Unit 3 was designed in accordance with the ASME Code Section III 1965 Edition with addenda up through Summer 1967 (UFSAR **C.5.1**). Subsequently while performing large-scale testing for the Mark III Containment System and in-plant testing for the Mark I Containment Systems, new suppression chamber (also referred to as the torus) hydrodynamic loads were identified. These additional loads result from blowdown into the suppression chamber during a postulated loss-of-coolant accident and during main steam relief valve operation during plant transients. The results of analyses of these effects were presented in the BFN Torus Integrity Long-Term Program Plant Unique Analysis Report. The suppression chamber, and suppression chamber vents including the vent headers and downcomers were modified in order to re-establish the original design safety margins. Allowable stresses for these components were in compliance with Subsection NE of the 1977 ASME Boiler and Pressure Vessel Code, Section III, including Summer 1977 Addenda.

The BFN Torus Integrity Long-Term Program Plant Unique Analysis Report describes a number of fatigue analyses. The following were evaluated to be TLAAs:

- Fatigue of suppression chamber, vents, and downcomers
- Fatigue of torus attached pipe and SRV discharge lines
- Fatigue of vent line and process penetration bellows

Disposition:

In analyzing and determining a disposition for these TLAAs, BFN applied the following criteria:

1. Since a 40-year CUF of 0.666 would provide no analytical or event margin when linearly extrapolated to 60 years, 10 CFR 54.21(c) disposition option (i) was applied to locations with a calculated 40-year CUF less than 0.4.
2. For locations where the 40-year CUF is greater than 0.4, 10 CFR 54.21(c) disposition option (iii) was applied. That is, fatigue will be managed by the Fatigue Monitoring Program described in Section **B.3.2**.

4.6.1 Fatigue of Suppression Chamber, Vents, and Downcomers

Summary Description

The BFN Torus Integrity Long-Term Program Plant Unique Analysis Report (PUAR) describes fatigue analyses of the suppression chamber and suppression chamber vents, including the vent headers and downcomers. The analyses assumed a limited number of main steam safety relief valve (SRV) actuations, based on plant data extrapolated to 40 years. Therefore, these analyses are TLAAs.

Analysis

The BFN Torus Integrity Long-Term Program Plant Unique Analysis Report assumed 500 SRV actuations during 40 years of normal operations and the contribution from the postulated worst-case LOCA. The worst-location fatigue CUFs were calculated to be:

- 0.681, in the vent headers where they intersect with the downcomers
- 0.373, at the downcomer/tiebar intersection
- 0.37, for the suppression chamber restraint snubbers.

Disposition: 10 CFR 54.3(c)(1)(iii) - The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Since only the SRV load cases contribute to fatigue during normal operation, normal operation may continue so long as the contribution from SRV actuations has not exceeded 1.0 minus the contribution expected from the postulated worst-case LOCA. To ensure that corrective actions are taken before CUFs approach 1.0, BFN will manage the high CUF location using the Fatigue Monitoring Program (Section **B.3.2**) to monitor SRV actuations.

It has been estimated for BFN, based on operating experience, that the total number of SRV actuations is not expected to exceed 500 actuations for any unit during the period of extended operation. The worst case estimate of the total number of SRV actuations expected at the end of the period of extended operation applies to Unit 2 and is estimated to be 493. The methodology to produce this estimate is as follows:

1. The number of SRV actuations from the startup of each unit through August 2003 was calculated using the following assumptions.
    a. Each SRV is cycled (opened and closed manually) once following each refueling outage to satisfy Technical Specifications Surveillance Requirement 3.4.3.2. Since valves are cycled for testing one at a time (i.e. not simultaneously), one actuation was counted for each SRV discharge line. Thirteen actuations were counted for the suppression chamber (i.e., 13 separate transients seen by the suppression chamber). It is assumed that this manual stroke testing was performed, and will continue to be performed coming out of every refueling outage, including the initial fuel load.

b. When a reactor trip occurred and SRVs were actuated as a result of the trip, the individual SRV that actuated was counted for each SRV discharge line associated with the SRV that actuated, but only one actuation is counted for the suppression chamber (i.e. the suppression chamber was only exposed to one transient). If the actual number of SRV actuations during a trip was unknown, it was conservatively assumed that all 13 SRVs actuated.

2. The number of valve actuations expected for the remainder of the current license term and for the requested period of extended operation has been estimated as follows:

   a. The BFN units are on a 24 month refueling cycle. The valve testing requirements of the Technical Specification will be performed once per 24 months with the same assumptions as above. There will be one actuation counted for each SRV discharge line and thirteen actuations will be counted for the suppression chamber for each scheduled refueling outage.

   b. It was assumed that one reactor scram per year would occur for each unit with the same assumptions as above. There will be one actuation counted for each SRV discharge line and one actuation counted for the suppression chamber.

      The assumption is considered to be conservative based on recent operating history. During the last 6 years of operation, Unit 2 has experienced five unplanned reactor scrams during which SRVs actuated and Unit 3 has experienced none.

   c. The period of extended operation will expire in 2033 for Unit 1, 2034 for Unit 2, 2036 for Unit 3. From 2003 until the expiration of the period of extended operation, there will be 26[14] years of operation for Unit 1, 31 years for Unit 2 and 33 years for Unit 3.

   d. The SRVs with the lowest setpoints are the ones that actuate during a reactor scram, if all SRVs do not actuate. A single SRV does not actuate more than once for each manual stroke test coming out of a refueling outage, or more than once per reactor scram event.

The number of SRV actuations from the startup of each unit through August 2003 was estimated to be 146 actuations for Unit 1, 254 actuations for Unit 2 (the worst case), and 188 actuations for Unit 3. The estimated total number of SRV actuations from August 2003 until the end of the period of extended operation was projected to be 239 for Unit 2. Thus the estimated total number of SRV actuations at the end of the period of extended operation for Unit 2 is 493.

14 Assuming Unit 1 restarts from its current extended outage in 2007.

4.6.2 Fatigue of Torus Attached Pipe and Safety Relief Valve Discharge Lines

Summary Description

There are thirteen Target Rock dual-mode main steam relief valves to allow blowdown from the main steam piping in the drywell to the suppression pool via individual discharge lines passing through the main vents. The main steam relief valve discharge piping enters the suppression chamber through penetrations in the suppression chamber vent header and the steam is discharged to the suppression pool water through a T-quencher attached to the suppression chamber.

Additionally, there are a number of external piping systems attached to the suppression chamber shell.

The Plant Unique Analysis Report (PUAR) describes that a fatigue evaluation of the torus attached piping (TAP), including the main steam relief valve piping, was performed per a program developed by the Mark I Owner's Group (MPR Associates, Mark I Containment Program Augmented Class 2/3 Fatigue Evaluation Method and Results for Typical Torus Attached and Main Steam Relief Valve Piping Systems, Report No. 751, November 1982). This analysis included the affects of mechanical load cycling in addition to the thermal expansion. The results justified fatigue life acceptability for TAP, including the SRV suppression chamber piping.

These analyses assume a limited number of main steam relief valve actuations throughout the 40-year life for the plant and are therefore TLAAs.

Analysis

The BFN analyses of fatigue effects of Mark I Containment cyclic “new loads” on main steam relief valve discharge lines internal to the suppression chamber and on torus attached piping external to the suppression chamber are evaluated in the PUAR. The analysis assumed 500 SRV actuations for a 40-year plant lifetime. The analysis concluded that the main steam relief valve discharge lines would have a fatigue CUF of less than 0.35 at the end of 40 years of operation. The analysis concluded that the worst case torus attached piping would have a fatigue CUF of less than 0.103 at the end of 40 years of operation.

Disposition: 10 CFR 54.3(c)(1)(i) - The analyses remain valid for the period of extended operation.

For the main steam relief valve discharge lines, T-quenchers, the main steam relief valve discharge line penetrations through the vent lines, torus attached piping systems, and the associated penetration locations, the predicted 60-year cumulative usage factor will be less than 0.666 (worst-case CUF is 0.35 x 60/40 = 0.53). Since the torus attached piping and main steam relief valve discharge lines fatigue analyses have a large margin in their design fatigue limit during the period of extended operation, the analyses will remain valid for the period of extended operation.

4.6.3 Fatigue of Vent Line and Process Penetration Bellows

Summary Description

The suppression chamber vent line bellows are flexible expansion joints allowing movement of the main vent pipes through the suppression chamber wall while maintaining the required pressure boundary. The analysis of the suppression chamber bellows was performed in accordance with Standards of the Expansion Joint Manufacture's Association, Inc. as described in the PUAR. These analyses assume a limited number of thermal cycles throughout the 40-year life for the plant and are TLAAs.

Containment pipe penetrations that must accommodate thermal movement have expansion bellows. The bellows are designed for a minimum number of operating thermal cycles over the design life at containment normal, test, and limiting design pressures. These analyses also assume a limited number of thermal cycles throughout the 40-year life for the plant and are therefore TLAAs.

Analysis

The suppression chamber vent line bellows allows differential movement of the vent system and suppression chamber to occur without developing significant interaction loads. As described in UFSAR C.5.2, the design life of the bellows is 7000 cycles.

Containment process piping expansion joints between the drywell shell penetrations and process piping are the only ones subject to significant thermal expansion and contraction. As described in UFSAR C.5.2, these containment penetration process bellows have been designed for 7000 cycles.

Disposition: 10 CFR 54.3(c)(1)(i) the analyses remain valid for the period of extended operation.

For the suppression chamber vent line bellows and the penetration bellows, thermal cycles are imposed by thermal cycles experienced by the attached piping. The assumed thermal cycle count for the analyses used in the codes associated with the piping and components can be conservatively approximated by the full thermal cycles (not including power reductions) used in the reactor vessel fatigue analysis listed in UFSAR Section 4.2.5. The total count of all these listed full thermal cycles (not including power reductions) is less than 1100 for a 40-year plant life. For the 60 year plant life, the number of thermal cycles for piping analyses would be proportionally increased to less than 1650, which is less than 25% of the 7000-cycle threshold limit.

Since the suppression chamber bellows and the containment penetration bellows fatigue analyses have a large margin to their design fatigue limit during the period of extended operation, the analyses remain valid for the extended operating period.

4.7 OTHER PLANT-SPECIFIC TIME-LIMITED AGING ANALYSES

4.7.1 Reactor Building Crane Load Cycles

Summary Description

There is one 125-ton Reactor Building overhead crane, which serves three reactor units. The crane provides the rated lifting load on the primary drum and an auxiliary load on a secondary drum. The Reactor Building crane provides a 5-ton auxiliary load hoist. The reactor building overhead crane is designed to meet the design loading requirements of the Crane Manufacturers Association of America (CMAA) Specification 70. For cyclic loading, CMAA 70 specifies that a crane classified as Service Class A1 is limited to 100,000 loading cycles over the design life. Therefore, the design life of the passive components of this crane is considered a TLAA.

Analysis

The reactor building crane handles shield plugs, reactor vessel and drywell heads, steam dryer and separator, spent fuel casks, equipment for the service and maintenance of the reactors, and equipment which is received or shipped through the equipment access lock. The crane was also used during plant construction and will probably be used during decommissioning. The total number of expected cycles for this crane over the entire life including construction, 60-years of operation for all three units, and decommissioning, has been conservatively estimated at less than 21,000 loading cycles. Of these, less than 1,000 lifts are expected to be more than 90% of the rated capacity.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

The analyses have been determined to be valid through the period of extended operation.

The analysis of the 125 ton reactor building crane qualifies the passive structural components for the extended life in accordance with CMAA 70 Service Class A1 requirements. The analysis shows that these passive components are more than adequate for the usage accumulated by construction of all three units, operation of all three units for each units 60 year life schedule, and decommissioning of the plant.

4.7.2 Corrosion - Flow Reduction

Summary Description

Carbon steel piping used in raw water systems exhibits increasing surface roughness due to general and localized corrosion. The effect of this phenomenon is higher resistance to water flow and therefore larger pressure drops. TVA, through measurements taken from piping of varying sizes and service ages, developed a parametric relationship that expresses the pipe diameter reduction due to corrosion as a function of time. A design document was developed using this data which provided the diameter reduction values out to 40 years. The pressure drop due to corrosion was then expressed as a function of the effective pipe diameter which is determined using the diameter reduction. Hydraulic calculations were performed (using the design document) to determine acceptability of raw water systems to meet design flow requirements at the end of a 40 year design life.

Thus, calculations using the design document's time dependent decreasing effective pipe diameter to verify 40-year flow requirements are TLAAs.

Analysis

General corrosion is the result of a chemical or electrochemical reaction between the material and the environment when both oxygen and moisture are present. General corrosion is characterized by uniform attack resulting in material dissolution, and sometimes corrosion product buildup. Carbon and low alloy steels are susceptible to general corrosion in systems using raw or untreated water.

General corrosion of carbon and low alloy steel in raw water is an aging mechanism that must be managed for the period of extended operation for the Residual Heat Removal Service Water System, the Emergency Equipment Cooling Water (EECW) System, and the High Pressure Fire Protection System.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

General corrosion that could result in inadequate flow for the Residual Heat Removal Service Water System, the Residual Heat Removal Service Water sump subsystem, and the EECW System is managed by the BFN Open-Cycle Cooling Water System Program (**B.2.1.17**).

General corrosion that could result in inadequate flow for the High Pressure Fire Protection System is managed by the Fire Water System Program (**B.2.1.24**).

4.7.3 Dose to Seal Rings for the High Pressure Coolant Injection and Reactor Core Isolation Cooling Containment Isolation Check Valves

Summary Description

The 40 year normal plus accident radiation dose was calculated for primary containment isolation check valves 71-40 and 73-45. This dose was used to qualify the valve elastomeric seals for the effects of radiation-induced degradation. The analysis verifying the acceptability of these elastomeric seals for the 40-year normal plus accident radiation dose is considered a TLAA.

Analysis

Following a LOCA, these isolation valves form part of the primary containment. Radiation-induced degradation to these elastomeric seals could cause primary containment leakage in excess of that assumed in the UFSAR Chapter **14.0** accident analysis.

The valves are the isolation valves for High Pressure Coolant Injection and Reactor Core Isolation Cooling (RCIC) Systems' injection lines into the FW System. They are shown on the following license renewal drawings:

HPCI	**1-47E812-1-LR**	**2-47E812-1-LR**	**3-47E812-1-LR**
RCIC	**1-47E813-1-LR**	**2-47E813-1-LR**	**3-47E813-1-LR**.

The 40 year normal plus accident radiation dose had been calculated and compared to the valve seals' qualification dose. The calculation was projected to include the 60-year normal plus accident radiation dose.

The calculation then compared the 60-year radiation dose with the qualification radiation dose for the valve seals.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

The analyses have been projected to the end of the period of extended operation. The conclusion drawn from the analyses is that the isolation valve seals are qualified for the radiation environment through the period of extended operation.

4.7.4 Radiation Degradation of Drywell Expansion Gap Foam

Summary Description

The steel drywell shell is enclosed in reinforced concrete for shielding purposes and to provide additional resistance to deformation and buckling of the drywell over areas where the concrete backs up the steel shell. Above the transition zone, the drywell is separated from the reinforced concrete by a gap of approximately 2 inches. This gap is filled with polyurethane foam. As described in UFSAR **5.2.3.2**, irradiation tests have shown that no change in the resilient characteristics will take place for exposures up to 1.0×10^8 Rads. The effect of a postulated increase in the foam stiffness resulting from radiation dose is a TLAA.

Analysis

The polyurethane foam material was chosen for its resistance to the environmental conditions likely to exist during its service life. Polyurethane foam samples, similar to those used in the gap, were irradiated in a test lab at various levels. The test results established that there was no detectable change in resilience below 1.0×10^8 Rads. The original design considered the effects of a 40-year lifetime dose of 1.0×10^7 Rads on the foam material, followed by a design basis LOCA that would expose the foam to 2.0×10^7 Rads during the first 12 hours after which the drywell would begin to contract as the temperature decreases. Since the projected exposure was less than the tested exposure, the resilient characteristics of the polyurethane foam were projected to remain intact during the 40-year design life.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

An analysis of the effect of dose on the foam for the additional 20 years of extended operation resulted in a total dose of less than 1.0×10^8 Rads. Therefore, the material properties will remain within the limits assumed by the original design analysis, in accordance with the aging assumptions assumed by the original design, for the period of extended operation.

4.7.5 Corrosion - Minimum Wall Thickness

Summary Description

Corrosion/erosion results in decreasing pipe wall thickness. This wall thickness reduction can result in the loss of the system pressure boundary. Corrosion allowance values specified in design documents were used to determine the minimum wall thickness values. These design documents specified corrosion allowance values for a 40-year service life. These calculations which used the corrosion allowance values specified in the design documents are considered a TLAA.

Analysis

Corrosion/erosion is an aging mechanism that must be managed for the period of extended operation. This approach to control the potential failure mechanism of corrosion/erosion is judged to be significantly better than attempting to project the minimum wall thickness calculations to 60 years.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Aging management reviews were performed for systems within the scope of license renewal in Section 3.0 of this application. The aging management reviews included corrosion/erosion as an aging effect to be considered and aging management programs were specified for components susceptible to corrosion/erosion.

The following aging management programs will be used to manage wall thining as specified in Sections **3.1**, **3.2**, **3.3**, and **3.4** of this application

Chemistry Control Program (**B.2.1.5**)

Flow-Accelerated Corrosion Program (**B.2.1.15**)

Open-Cycle Cooling Water System Program (**B.2.1.17**)

Closed-Cycle Cooling Water System Program (**B.2.1.18**)

Fire Water System Program (**B.2.1.24**)

One-Time Inspection Program (**B.2.1.29**)

Buried Piping and Tanks Inspection Program (**B.2.1.31**)

4.7.6 Irradiation Assisted Stress Corrosion Cracking (IASCC) of Reactor Vessel Internals

Summary Description

Austenitic stainless steel reactor internal components exposed to neutron fluence greater than 5×10^{20} n/cm^2 (E > 1 MeV) are considered susceptible to Irradiation Assisted Stress Corrosion Cracking (IASCC) in the BWR environment. As described in the SER (ML003776810, 12/07/2000) to BWRVIP-26, “BWR Top Guide Inspection and Flaw Evaluation Guidelines,” IASCC of reactor internals is considered a TLAA.

Analysis

Fluence calculations have been performed for the reactor vessel and internals. Four components have been identified as being susceptible to IASCC for the period of extended operation: (1) Top Guide; (2) Shroud; (3) Core Plate and (4) In-core Instrumentation Dry Tubes and Guide Tubes.

Disposition: 10 CFR 54.21(c)(1)(iii) – The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

The top guide, shroud, core plate and in-core instrumentation dry tubes and guide tubes are considered susceptible to IASCC. The aging effect associated with IASCC, crack initiation and growth, will require aging management. Three components, top guide, shroud and in-core instrumentation dry tubes and guide tubes, have been evaluated by the BWRVIP, as described in the Inspection and Evaluation Guidelines for each component: BWRVIP-26 (Top Guide), BWRVIP-76 (Shroud), and BWRVIP-47 (in-core instrumentation dry tubes and guide tubes). BFN implements the BWRVIP recommendations, as described in **B.2.1.5** (Chemistry Control Program) and **B.2.1.12** (BWR Vessel Internals Program).

The core plate has been determined to be susceptible to IASCC and this is considered a plant-specific TLAA. BFN will manage this TLAA with two aging management programs: Chemistry Control Program (**B.2.1.5**) and BWR Vessel Internals Program (**B.2.1.12**). For the period of extended operation, the BWR Vessel Internals Program will perform inspections of the core plate in the regions of the highest fluence.

4.7.7 Stress Relaxation of the Core Plate Hold-Down Bolts

Summary Description

As described in the SER (ML003775989, 12/07/2000) to BWRVIP-25, "BWR Core Plate Inspection and Flaw Evaluation Guidelines," plants must consider relaxation of the rim-hold-down bolts as a TLAA issue. Since BFN has not installed core plate wedges, the loss of preload must be considered in the TLAA evaluation.

Analysis

The core plate hold-down bolts connect the core plate to the core shroud. These bolts are subject to stress relaxation due to thermal and irradiation effects. For the 40-year lifetime, the BWRVIP concluded that all rim hold-down bolts will maintain some preload throughout the life of the plant.

Disposition: 10 CFR 54.21(c)(1)(ii) – The analyses have been projected to the end of the period of extended operation.

For the period of extended operation, the expected loss of preload was assumed to be 20%, which bounds the original BWRVIP analysis. With a loss of 20% in preload, the core plate will maintain sufficient preload to prevent sliding under both normal and accident conditions. Therefore, the loss of preload is acceptable for the period of extended operation.

BWRVIP-25, “BWR Core Plate Inspection and Flaw Evaluation Guidelines, “ December, 1996	ML003775989, 12/07/00
BWRVIP-26, “BWR Top Guide Inspection and Flaw Evaluation Guidelines,” December, 1996	ML003776810, 12/07/00

4.7.8 Emergency Equipment Cooling Water Weld Flaw Evaluation

Summary Description

Analysis was performed on 17 select EECW System piping welds which have flaws larger than normally considered acceptable. The analysis included a stress evaluation of the flawed welds and fatigue crack growth calculations. The fatigue crack growth calculations were based on a conservative projection of 125 cycles for the remainder of the plant operating live. The fatigue crack growth portion of this analysis will be considered a TLAA.

Analysis

The weld flaw qualification of 17 EECW welds includes fatigue crack growth calculations which were based on a conservative projection of 125 cycles for the remaining 25 years of the plant operating life. A cycle occurs when piping, including a subject weld, is removed from service then returned to service. This projection was derived from a very conservative estimate that each weld could experience up to 5 cycles per year. Review of the system function indicates that continuous operation is intended; however, some interruptions have been required for maintenance and other considerations. Based on current and recent plant operating experience, it is unusual for any of these weld locations to experience more than 1 cycle in any given year. Therefore, it is conservative to use 2 cycles per year for the past and foreseeable future.

Disposition: 10 CFR 54.21(c)(1)(i) – The analyses remain valid for the period of extended operation.

The conservative cycle count of 2 cycles per year was applied to the 25 remaining operating years (projected when the calculations were performed), plus the 20 years of extended operation, resulting in a total cycle count of 90. This is less than the estimated cycle count used for qualification in the original calculation. Therefore, the original calculations remain valid for the extended operating period.

4.8 EXEMPTIONS

In accordance with 10 CFR 54.21(c)(2) TVA evaluated plant-specific exemptions granted pursuant to 10 CFR 50.12 and identified none as being a TLAA as defined in 10 CFR 54.3.

4.9 CHAPTER 4 REFERENCES

4.9.1 General and Methodology References

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

b. 10 CFR 50.12, Specific Exemptions

c. NUREG-1800, Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants

d. NUREG-1801, Generic Aging Lessons Learned Report

e. NEI 95-10 Rev 3, Industry Guidelines for Implementing the Requirements of 10 CFR Part 54 - The License Renewal Rule, March 2001

f. BFN Updated Final Safety Analysis Report

4.9.2 Specific References

Section 4.2 - Neutron Embrittlement of the Reactor Vessel and Internals

a. 10 CFR 50.60, Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Power Reactors for Normal Operation

b. 10 CFR 50 Appendix G, Fracture Toughness Requirements

c. 10 CFR 50 Appendix H, Reactor Vessel Material Surveillance Requirements

d. Letter, S.A. Richard, USNRC to J.F. Klapproth, GE-NE, "Safety Evaluation for NEDC-32983P, General Electric Methodology for Reactor Pressure Vessel Fast Neutron Flux Evaluation (TAC No. MA9891)", September 14, 2001.

e. UFSAR 4.2, Reactor Vessel And Appurtenances Mechanical Design

f. Ranganath, S., "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979, Paper G1/5.

g. EPRI TR-108279 (BWRVIP-35), "Fracture Toughness and Tensile Properties of Irradiated Austenitic Stainless Steel Components Removed from Service," June 1997 (EPRI Proprietary Information).

h. EPRI Report TR-105697, "BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05)," September 28, 1995

i. EPRI Report TR-105697, BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Weld Inspection Recommendations (BWRVIP-05), September 28, 1995, with supplementing letters of June 24 and October 29, 1996, May 16, June 4, June 13, and December 18, 1997, and January 13, 1998 (EPRI Proprietary Information).

j. NRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, “Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report,” (TAC No. M93925), July 28, 1998.

k. NRC letter from Jack R. Strosnider, to Carl Terry, BWRVIP Chairman, “Supplement to Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report,” (TAC No. MA3395), March 7, 2000.

l. “Design and Performance of General Electric Boiling Water Reactor Jet Pumps,” APED-5460, September 1968.

m. Appendix A to Section XI of the ASME Boiler and Pressure Vessel Code, 1998 Edition through 2000 Addenda.

n. L.A. England (BWR Owners’ Group) to Daniel G. McDonald (USNRC), “BWR Owners’ Group Topical Report on Upper-Shelf Energy Equivalent Margin Analysis – Approved Version”, BWROG-94037, March 21, 1994.

o. NRC letter (Accession No. ML012920549) to BWRVIP, “Acceptance Criteria for Referencing of EPRI Proprietary Report TR-113596, ‘BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Inspection and Flaw Evaluation Guidelines (BWRVIP-74)’ and Appendix A, ‘Demonstration of Compliance with the Technical Information Requirements of the License Renewal rule (10 CFR 54.21’,“ October 18, 2001

p. EPRI report TR-1003346, “Updated BWR Integrated Surveillance Program (ISP) Implementation Plan, ”October 2002 (BWRVIP-86-A) (EPRI Proprietary).

q. Regulatory Guide 1.99, Revision 2, Radiation Embrittlement of Reactor Vessel Materials

r. UFSAR Section **3.3.5,** Reactor Vessel Internals Mechanical Design Safety Evaluation

s. Generic Letter 98-05, “Boiling Water Reactor Licensees Use of the BWRVIP-05 Report to Request Relief from Augmented Examination Requirements on Reactor Pressure Vessel Circumferential Shell Welds”

t. NRC letter to TVA, “Browns Ferry Nuclear Plant Unit 2, Relief Request 2-ISI-9, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA8424),” 11/18/1999

u. NRC letter to TVA, “Browns Ferry Nuclear Plant Unit 3, Relief Request 3-ISI-1, Revision 1, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA5953),” 11/18/1999

v. Technical Specifications 3.4.9, RCS Pressure and Temperature (P/T) Limits

w. GENE NEDO-32205-A, “10 CFR 50 Appendix C Equivalent Margin Analysis for Low Upper-Shelf Energy in BWR-2 Through BWR-6 Vessels," February 1994

x. ASTM-185, “Standard Practice for Conducting Surveillance Tests for Light-Water Cooled Nuclear Power Reactor Vessels”

Section 4.3 - Metal Fatigue

a. NUREG/CR-6260, “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” March 1995.

b. UFSAR Section 4.2.5, Reactor Vessel And Appurtenances Mechanical Design Safety Evaluation

c. ASME Boiler and Pressure Vessel Code Section Section III

d. USAS B31.1

e. NRC Information Notice 92-54, “Level Instrumentation Inaccuracies Caused by Rapid Depressurization”

f. Generic Letter 92-04, “Resolution of the Issues Related to Reactor Vessel Water Level Instrumentation in BWRs Pursuant to 10 CFR 50.54(f)”

g. U. S. Nuclear Regulatory Commission, Generic Safety Issue 190, "Fatigue Evaluation of Metal Components for 60-Year Plant Life."

h. Memorandum, Ashok C. Thadani, Director, Office of Nuclear Regulatory Research, to William D. Travers, Executive Director for Operations, Closeout of Generic Safety Issue 190, “Fatigue Evaluation of Metal Components for 60 Year Plant Life,” U. S. Nuclear Regulatory Commission, Washington, DC, December 26, 1999.

i. NUREG/CR-6260 (INEL-95/0045), “Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components,” March 1995.

j. NUREG/CR-6583 (ANL-97/18), “Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels,” March 1998.

k. NUREG/CR-5704 (ANL-98/31), “Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels,” April 1999.

Section 4.4 Environmental Qualification of Electrical Equipment

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

b. NRC Regulatory Issue Summary 2003-09, “Environmental Qualification of Low-Voltage Instrumentation and Control Cables,” (Accession No. 031220078), May 2, 2003

c. GSI-168, “Environmental Qualification of Low Voltage Instrumentation & Control Cables.”

d. DOR Guidelines, “Guidelines for Evaluating Environmental Qualification of Class 1E Electrical Equipment in Operating Reactors,” U.S. Nuclear Regulatory Commission, June 1979.

e. NUREG-0588, “Interim Staff Position on Environmental Qualification of Safety Related Electrical Equipment,” U.S. Nuclear Regulatory Commission, July 1981.

f. Regulatory Guide 1.89, Revision 1, “Environmental Qualification of Certain Electrical Equipment Important to Safety for Nuclear Power Plants,” U.S. Nuclear Regulatory Commission, June 1984.

Section 4.5 Loss of Prestress in Concrete Containment Tendons

None

Section 4.6 Primary Containment Fatigue

a. Browns Ferry Nuclear Plant, Torus Integrity Long Term Program, Plant Unique Analysis Report (PUAR), TVA Report No. CEB-83- 34, Revision 2, December 10, 1984, (CEB 841210-008).

b. UFSAR **C.2.5.3**, Primary Containment System and Penetrations

c. UFSAR **C.5**, Primary Containment System and Penetrations

d. U.S. Nuclear Regulatory Commission, Safety Evaluation of Browns Ferry Nuclear Plant, Units 1, 2, and 3, Mark I Containment Long - Term Program, Pool Dynamic Loads Review, May 6, 1985, Accession No. 8505160214.

e. UFSAR **4.2**, Reactor Vessel and Appurtenances

f. UFSAR **C.5.3**, Primary Containment Bellows Stress Analysis

Section 4.7 Other Plant-Specific Time-Limited Aging Analyses

a. Crane Manufacturers Association of America (CMAA) Specification 70, Class A1.

b. UFSAR **14.6.3.5**, Fission Product Release From Primary Containment

c. Technical Specification 5.5.2, “Primary Coolant Sources Outside Containment

d. UFSAR Section **5.2.3.2**, Drywell

e. Browns Ferry Nuclear Plant Response to NRC Request for Additional Information Number 12.5 (1971)

f. BWRVIP-26 “BWR Top Guide Inspection and Flaw Evaluation Guidelines,” December, 1996.

g. BWRVIP-76, “BWR Core Shroud Inspection and Flaw Evaluation Guidelines”, November 1999.

h. BWRVIP-47, “BWR Lower Plenum Inspection and Flaw Evaluation Guidelines,” December 1997.

i. BWRVIP-25, “BWR Core Plate Inspection and Flaw Evaluation Guidelines,” December 1996.

BROWNS FERRY NUCLEAR PLANT LICENSE RENEWAL APPLICATION

APPENDIX A

UFSAR SUPPLEMENT

APPENDIX A TABLE OF CONTENTS

A.0 INTRODUCTION

This appendix contains a summary description of the Aging Management Program activities and the Time-Limited Aging Analyses (TLAAs). These summary descriptions will be incorporated into the Updated Final Safety Analysis Report for the Browns Ferry Plant following the issuance of the renewed operating licenses.

A.1 AGING MANAGEMENT PROGRAMS

A.1.1 Accessible Non-Environmental Qualification Cables and Connections Inspection Program

The Accessible Non-Environmental Qualification (EQ) Cables and Connections Inspection Program is a new program that will manage the aging effects of insulated cables and connections within the scope of license renewal exposed to adverse localized environments. The Accessible Non-EQ Cables and Connections Inspection Program is a condition monitoring program. A sample of non-EQ insulated cables and connections will be inspected. The sample will include power, instrumentation, control, and communication applications located in accessible adverse localized environments. If an unacceptable condition or situation is identified for a cable or connection in the inspection sample, an evaluation will determine if the same condition or situation is applicable to other accessible or inaccessible cables or connections.

This new program will be implemented prior to the period of extended operation.

A.1.2 Electrical Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used In Instrumentation Circuits Program

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification (EQ) Requirements Used in Instrumentation Circuits Program manages the aging effects of sensitive, low level signal circuits exposed to adverse localized environments. The scope of this program is limited to the cables of the local power range monitors. This program is a condition monitoring program using the calibration test of the local power range monitors mandated by Technical Specifications. When a local power range monitor is found to be out of calibration, evaluations that consider the possibility of cable degradation will be performed and appropriate corrective actions will be taken if cable degradation is determined to exist.

A.1.3 Inaccessible Medium Voltage Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Program

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will manage the aging effects of medium voltage cables that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by moisture while energized. The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a condition monitoring program. Medium voltage cables that are installed in underground conduit duct banks and that perform an intended function within the scope of license renewal (such as the medium voltage cables to the Residual Heat Removal Service Water pumps) will be tested 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 cable insulation due to wetting.

This new program will be implemented prior to the period of extended operation.

A.1.4 ASME Section XI Inservice Inspection Subsections IWB, IWC, and IWD Program

10 CFR 50.55(a) imposes the inservice inspection requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code Section XI for Class 1, 2, and 3 pressure retaining components and their integral attachments. The ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program includes periodic visual, surface, and/or volumetric examination of Class 1, 2, and 3 pressure retaining components and their integral attachments.

A.1.5 Chemistry Control Program

The Chemistry Control Program consists of monitoring and control of water chemistry to keep peak levels of various contaminants below system specific limits based on the industry recognized guidelines of EPRI TR-103515, “BWR Water Chemistry Guidelines - (BWRVIP-79).”

This program will be enhanced to implement the EPRI TR-103515 guidelines for Unit 1 prior to the period of extended operation.

A.1.6 Reactor Head Closure Studs Program

The BFN Reactor Head Closure Studs Program includes:

(a) Inservice inspection in conformance with the requirements of the American Society of Mechanical Engineers B&PV Code Section XI Subsection IWB Table IWB 2500-1.

(b) Preventive measures to mitigate cracking. The preventive measures of Regulatory Guide 1.65, “Materials and Inspections for Reactor Vessel Closure Studs,” are implemented. Approved lubricants minimize the potential of cracking of the non-metal-plated reactor head closure studs.

A.1.7 Boiling Water Reactor Vessel Inside Diameter Attachment Welds Program

The Boiling Water Reactor (BWR) Vessel Inside Diameter (ID) Attachment Welds Program includes:

(a) Inspection and flaw evaluation in conformance with the guidelines of staff approved Boiling Water Reactor Vessel and Internals Project (BWRVIP)-48, “Vessel ID Attachment Weld Inspection and Evaluation Guidelines.” Inspections and flaw evaluations are performed by the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD aging management program.

(b) Monitoring and control of reactor coolant water chemistry by the Chemistry Control Program.

This program will be enhanced to implement the BWRVIP guidelines for Unit 1 prior to the period of extended operation.

A.1.8 Boiling Water Reactor Feedwater Nozzle Program

The BWR Feedwater Nozzle Program includes:

(a) Inservice inspection in accordance with the requirements of the ASME B&PV Code Section XI Subsection IWB Table IWB 2500-1 and the recommendations of General Electric NE-523-A71-0594 “Alternate BWR Feedwater Nozzle Inspection Requirements."

(b) System modifications to mitigate cracking. The program addressed BWR feedwater nozzle cracking by implementation of NUREG-0619, “BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking,” recommendations. The BFN feedwater nozzles have been modified to mitigate cracking by removing the stainless steel cladding and machining the safe end and nozzle bore and inner bend radius to accept improved double piston ring interference fit spargers with a forged tee design and orificed elbow discharges. The reactor water cleanup system return lines were routed to both feedwater headers (except Unit 2). Changes to plant operating procedures, such as improved feedwater control, to decrease the magnitude and frequency of temperature fluctuations have been implemented on Units 2 and 3.

This program will be enhanced to implement the Boiling Water Reactor Feedwater Nozzle Program on Unit 1 prior to the period of extended operation.

A.1.9 Boiling Water Reactor Control Rod Drive Return Line Nozzle Program

The BWR Control Rod Drive Return Line Nozzle Program includes:

(a) Inservice inspection in accordance with the ASME B&PV Code Section XI Subsection IWB, IBC, and IWD aging management program.

(b) System modifications and maintenance programs to mitigate cracking. BFN has modified the Control Rod Drive Return lines to meet the recommendations of NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking." The Control Rod Drive Return line flow returns to the Reactor Water Cleanup System piping. The Control Rod Drive Return line nozzle piping has been removed and the reactor vessel nozzles have been capped.

A.1.10 Boiling Water Reactor Stress Corrosion Cracking Program

The BWR Stress Corrosion Cracking Program manages intergranular stress corrosion cracking in reactor coolant pressure boundary components made of stainless steel. The BWR Stress Corrosion Cracking Program is consistent with NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," BWRVIP-75, "Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules," and Nuclear Regulatory Commission Generic Letter 88-01, "NRC Position on Intergranular Stress Corrosion Cracking in BWR Austenitic Stainless Steel Piping," and its Supplement 1. The program includes:

(a) Replacements and preventive measures to mitigate intergranular stress corrosion cracking. Replacement methodologies include piping replacement with IGSCC resistant stainless steel. Preventive measures include heat sink welding, induction heating, mechanical stress improvement and water chemistry control in accordance with industry recognized guidelines.

(b) Inspections to monitor intergranular stress corrosion cracking and its effects. The ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program has incorporated the guidelines delineated in NUREG-0313, NRC GL 88-01, and BWRVIP-75.

This program will be enhanced to implement the Stress Corrosion Cracking Program on Unit 1 prior to the period of extended operation.

A.1.11 Boiling Water Reactor Penetrations Program

The BWR Penetrations Program includes:

(a) Inspection and flaw evaluation in conformance with the guidelines of staff approved Boiling Water Reactor Vessel and Internals Project BWRVIP-49, "Instrument Penetration Inspection and Flaw Evaluation Guidelines," and BWRVIP-27, "BWR Standby Liquid Control System/Core Plate Delta-P Inspection and Flaw Evaluation Guidelines," documents. Inspection and flaw evaluation is conducted in accordance with the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program, which has incorporated the BWRVIP-27 and BWRVIP-49 guidelines. Required repairs or replacements implement the recommendations of BWRVIP-53 and BWRVIP-57 into procedures which are performed in accordance with ASME Section XI repair and replacement requirements.

(b) Monitoring and control of reactor coolant water chemistry in accordance with guidelines of EPRI TR-103515, “BWR Water Chemistry Guidelines - (BWRVIP-79).”

This program will be enhanced to implement the BWRVIP guidelines for Unit 1 prior to the period of extended operation.

A.1.12 Boiling Water Reactor Vessel Internals Program

The BWR Vessel Internals Program includes:

(a) Inspection and flaw evaluation in conformance with ASME Section XI as augmented by the guidelines of applicable Boiling Water Reactor Vessel and Internals Project documents. The processes of BWRVIP-94 are used to implement the BWRVIP.

(b) Monitoring and control of reactor coolant water chemistry in accordance with industry recognized guidelines of EPRI TR-103515, “BWR Water Chemistry Guidelines - (BWRVIP-79)” to ensure the long term integrity and safe operation of boiling water reactor vessel internal components.

This program will be enhanced to implement the BWRVIP guidelines for Unit 1 prior to the period of extended operation.

A.1.13 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) Program

The Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) aging management program monitors the effects of loss of fracture toughness on the intended function of the component by performing supplemental examinations of CASS reactor vessel internals component. The reactor vessel internals receive a visual inspection in accordance with the ASME B&PV Code Section XI Subsection IWB Category B-N-3 requirements. Visual inspections incorporate the requirements of the BWR Vessel and Internals Program are performed to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS reactor vessel internals. The visual inspections include the ability to achieve a 0.0005 in. resolution, with the conditions (e.g., lighting and surface cleanliness) of the inservice examination bounded by those used to demonstrate the resolution of the inspection technique.

This program will be enhanced to implement the Thermal Aging and Neutron Irradiation Embrittlement of CASS Program on Unit 1 prior to the period of extended operation.

A.1.14 Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion Program consists of appropriate analysis and baseline inspections followed by the determination of the extent of thinning with replacement or repair of components if necessary. This program is in response to NRC Generic Letter 89-08, “Erosion/Corrosion-Induced Pipe Wall Thinning.” The program is based on EPRI NSAC-202L, “Recommendations for an Effective Flow-Accelerated Corrosion Program,” guidelines.

This program will be enhanced to implement NSAC-202L recommendations for Unit 1 prior to the period of extended operation.

A.1.15 Bolting Integrity Program

The Browns Ferry Bolting Integrity Program provides for condition monitoring of selected pressure retaining bolted joints and external surfaces for piping and components within the scope of license renewal. The Bolting Integrity Program provides for:

(a) Preventive Actions - Plant procedures specify selection of bolting material and the use of lubricants and sealants. The program is consistent with the guidelines of EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and the additional recommendations of NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” to prevent or mitigate degradation and failure of safety-related bolting.

(b) Condition monitoring - The BFN Bolting Integrity Program includes inservice inspections of Class 1, 2, and 3 components in accordance with ASME Section XI, Subsections IWB, IWC, and IWD Program. Inspection for bolting within the scope of license renewal not included in the ASME Section XI, Inservice Inspection (ISI) aging management program is provided by the System Monitoring Program.

The aging effects of reactor vessel internal bolting and closure bolting are not managed by the Bolting Integrity Program.

A.1.16 Open-Cycle Cooling Water System Program

The Open-Cycle Cooling Water Program manages loss of material, biofouling, pitting, flow blockage, and reduction of heat transfer aging effects in raw cooling water piping and components. The activities for managing aging effects include:

(a) Condition monitoring - System and component testing, visual inspections, and NDE testing are conducted.

(b) Preventive actions - Biocide treatments and filtering are used to prevent loss of material due to MIC and biofouling and flow blockage and reduction of heat transfer due to biological and particulate fouling.

The Open-Cycle Cooling Water System Program relies on the guidelines of NRC Generic Letter 89-13, “Service Water System Problems Affecting Safety-Related Equipment.”

This program will be enhanced to implement GL 89-13 for Unit 1 prior to the period of extended operation.

A.1.17 Closed-Cycle Cooling Water System Program

The Closed-Cycle Cooling Water System Program includes (a) preventive measures to minimize corrosion and (b) surveillance testing and inspection to monitor the effects of corrosion on the intended function of the component. The program relies on maintenance of system corrosion inhibitor concentrations within specified limits of EPRI Report TR-107396, “Closed Cooling Water Chemistry Guideline,” to minimize corrosion. Testing and inspection in accordance with EPRI TR-107396 for closed-cycle cooling water systems is performed to evaluate system and component performance.

This program will be enhanced to implement EPRI TR-107396 for Unit 1 prior to the period of extended operation.

A.1.18 Inspection of Overhead Heavy Load and Light Load Handling Systems Program

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program is a condition monitoring program that is implemented by the 10 CFR 50.65 Maintenance Rule program. Visual inspections verify the structural integrity of crane components. Inspection requirements are consistent with the guidance provided by NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants” for load handling systems that handle heavy loads which can directly or indirectly cause a release of radioactive materials and with applicable industry standards for other cranes within the scope of license renewal. The effectiveness of the program being monitored is in accordance with the guidance of RG 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.”

A.1.19 Compressed Air Monitoring Program

The Compressed Air Monitoring Program consists of:

(a) Condition monitoring - Inspection and testing of the system is performed.

(b) Preventive actions - Air quality at various locations in the system is monitored to ensure that oil, water, rust, dirt, and other contaminants are kept within the specified limits.

The Compressed Air Monitoring Program is based on NRC GL 88-14, “Instrument Air Supply System Problems Affecting Safety-Related Equipment,” and the Institute of Nuclear Power Operations Significant Operating Experience Report 88-01, “Instrument Air System Failures.” The Compressed Air Monitoring Program also incorporates provisions conforming to the guidance of the EPRI NP-7079, “Instrument Air Systems, A Guide for Power Plant Maintenance Personnel.”

This program will be enhanced to implement the requirements of ASME OM-S/G-2000, ANSI/ISA-S7.0.01, and EPRI TR-108147 prior to the extended period of operation. Additionally, this program will be implemented for Unit 1 prior to the period of extended operation.

A.1.20 BWR Reactor Water Cleanup System Program

The BWR Reactor Water Cleanup System Program applies to RWCU piping welds outboard of the second isolation valve. The BWR Reactor Water Cleanup System Program monitors and controls reactor water chemistry based on industry recognized guidelines of EPRI Report TR-103515, “BWR Water Chemistry Guidelines (BWRVIP-79)" to reduce the susceptibility of Reactor Water Cleanup System piping to stress corrosion cracking and intergranular stress corrosion cracking.

On Units 2 and 3 reactor water cleanup system piping has been replaced with piping that is resistant to intergranular stress corrosion cracking in response to NRC Generic Letter 88-01, “NRC Position on Intergranular Stress Corrosion Cracking (IGSCC) in BWR Austenitic Stainless Steel Piping," concerns. In addition, all actions requested in NRC Generic Letter 89-10, “Safety-Related Motor-Operated Valve Testing and Surveillance,” have been completed.

This program will be enhanced to implement the BWRVIP guidelines, NRC Generic Letter 88-01, and Generic Letter 89-10 for Unit 1 prior to the period of extended operation.

A.1.21 Fire Protection Program

The Fire Protection Program includes fire barrier inspections and diesel-driven fire pump tests. Fire Protection inspections and tests are mandated by the Fire Protection Report Volume 1, which is incorporated by reference into UFSAR **10.11**.

The Fire Protection Report requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection of fire rated doors to ensure that their operability is maintained. The Fire Protection Report requires that the diesel driven fire pumps be periodically tested to ensure that the fuel supply line can perform the intended function. The Fire Protection Report also includes periodic inspection and test of the carbon dioxide fire suppression system.

This program will be enhanced to update the Fire Protection Report to include Unit 1 as an operating unit prior to the period of extended operation.

A.1.22 Fire Water System Program

The Fire Water System Program applies to water based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, water storage tanks, and aboveground and underground piping and components that are tested in accordance with the applicable National Fire Protection Association codes and standards. The fire water system tests are mandated by the Fire Protection Report Volume 1, which is incorporated by reference into UFSAR **10.11**.

This program will be enhanced to perform flow tests or non-intrusive examinations to identify loss of material due to corrosion on BFN Unit 1, Unit 2, and Unit 3 prior to the period of extended operation. Sprinkler head inspections for each unit will be performed prior to the end of the fifty year service life and at ten year intervals thereafter in accordance with NFPA-25.

This program will be enhanced to update the Fire Protection Report to include Unit 1 as an operating unit prior to the period of extended operation.

A.1.23 Aboveground Carbon Steel Tanks Program

The Aboveground Carbon Steel Tanks Program includes preventive measures to mitigate corrosion by protecting the external surface of carbon steel tanks with paint or coatings in accordance with standard industry practice. The Aboveground Carbon Steel Tanks Program also relies on periodic inspections conducted in accordance with the 10 CFR 50.65 Maintenance Rule program and the Systems Monitoring Program to monitor tank degradation.

A.1.24 Fuel Oil Chemistry Program

The Fuel Oil Chemistry Program relies on a combination of surveillance and maintenance procedures. Monitoring and controlling fuel oil contamination maintains the fuel oil quality. Exposure to fuel oil contaminants such as water and microbiological organisms is minimized by fuel oil sampling and analysis, including analysis of new fuel before its introduction into the storage tanks. If required, a biocide is added to the fuel oil storage tanks during each new fuel delivery. Sampling and testing of diesel fuel oil is in accordance with American Society for Testing Materials Standards D 1796, D 2276, and D 4057.

A.1.25 Reactor Vessel Surveillance Program

The BFN Reactor Vessel Surveillance Program is mandated by 10 CFR 50 Appendix H. The BFN Reactor Vessel Surveillance Program is an integrated surveillance program in accordance with 10 CFR Part 50 Appendix H Paragraph III.C that is based on requirements established by the BWR Vessel and Internals Project reports.

This program will be enhanced to ensure the BFN Unit 1, Unit 2, and Unit 3 reactor vessels meet the requirements of 10 CFR 50 Appendix H prior to the period of extended operation.

A.1.26 One-Time Inspection Program

The One-Time Inspection Program is a new program that will include measures to verify that unacceptable degradation is not occurring; thereby validating the effectiveness of existing programs or confirming that there is no need to manage aging related degradation for the period of extended operation. The One-Time Inspection Program will be completed prior to entering the period of extended operation. The elements of the One-Time Inspection Program will include:

(a) Determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience.

(b) Identification of the inspection locations in structures or components based on the aging effect.

(c) Determination of the examination technique, including acceptance criteria that would be effective in detecting the age related effect for which the component is examined. Non-destructive techniques will generally be used. However in some circumstances (e.g., small bore reactor coolant pressure boundary), destructive testing will be utilized if samples become available.

(d) Evaluation of the need for follow up examinations to monitor the progression of any aging degradation. When one-time inspections fail to meet the established acceptance criteria, the corrective action program will be used to schedule, track, and trend the appropriate corrective actions and follow up inspections.

This new program will be implemented prior to the period of extended operation.

A.1.27 Selective Leaching of Materials Program

The Selective Leaching of Materials Program will consist of one-time visual inspections and hardness measurements on selected components susceptible to selective leaching. The materials of construction for these components may include cast iron, brass, bronze, or aluminum-bronze. These components may be exposed to a raw water, treated water, or ground water environment.

This new program will be implemented prior to the period of extended operation.

A.1.28 Buried Piping and Tanks Inspection Program

There are no buried tanks that are within the scope of license renewal; however, buried piping within the scope of license renewal exists such that the program is needed. The Buried Piping and Tanks Inspection Program includes:

(a) Preventive measures to mitigate corrosion - External coatings and wrappings have been applied in accordance with standard industry practice.

(b) Inspections in accordance with the 10 CFR 50.65 Maintenance Rule program to manage the effects of corrosion on the pressure retaining capacity of buried carbon steel piping. Buried piping will be inspected when excavated for any reason.

A.1.29 ASME Section XI Subsection IWE Program

10 CFR 50.55a imposes the inservice inspection requirements of the ASME B&PV Code Section XI for steel containments (Class MC). The ASME B&PV Code Section XI Subsection IWE Inservice Inspection Program includes visual examination and augmented examinations (visual and/or volumetric examination). Inspections or testing are conducted on the steel containment shells and their integral attachments; containment hatches and airlocks; seals, gaskets, and moisture barriers; and pressure retaining bolting in accordance with ASME B&PV Code Section XI Subsection IWE, 1992 edition through 1992 addenda.

One hundred percent of the examinations required in Examination Categories of Table IWE-2500-1 for the first Inspection Interval will be completed as pre-service exams before Unit 1 restarts, except where specific written relief has been granted by NRC or excluded by 10 CFR 50.55a. The requirements of ASME Section XI Inservice Inspection Subsection IWE, 1992 Edition with the 1992 Addenda will be implemented on Unit 1.

A.1.30 ASME Section XI Subsection IWF Program

10 CFR 50.55a imposes the inservice inspection requirements of the ASME B&PV Code Section XI for Class 1, 2, and 3 piping and component supports. The ASME Section XI, Subsection IWF Program consists of periodic visual examination of ASME Section XI Class 1, 2, and 3 piping and component supports for signs of degradation, evaluation, and establishment of corrective actions. The Unit 3 program is in accordance with ASME Section XI, Subsection IWF, 1989 Edition and Code Case N-491. The Unit 2 program is in accordance with the 1995 edition through the 1996 addenda.

Prior to restart from its extended outage, pre-service inspections will be performed on the ASME equivalent Class 1, 2, and 3 component supports for Unit 1. The requirements of ASME Section XI Subsection IWF, 1995 Edition with Addenda through 1996 will be implemented on Unit 1.

A.1.31 10 CFR 50 Appendix J Program

The 10 CFR 50 Appendix J program monitors leakage rates through the containment pressure boundary (including the drywell and torus, penetrations, fittings, and other access openings) in order to detect degradation of the primary containment pressure boundary. Seals, gaskets, and bolted connections are also monitored. Type A and Type B containment leak rate tests are performed in accordance with the regulations in 10 CFR 50 Appendix J Option B; and the guidance provided in Regulatory Guide 1.163, “Performance-Based Containment Leak-Testing Program;" NEI 94-01, “Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J.”

A.1.32 Masonry Wall Program

The Masonry Wall program provides for condition monitoring of masonry walls. The program is included in the Structures Monitoring Program that implements the structures monitoring requirements of 10 CFR 50.65. Masonry wall condition monitoring is based on guidance provided in NRC Bulletin 80-11 “Masonry Wall Design” and Information Notice 87-67 “Lessons Learned from Regional Inspections of Licensee Actions in Response to I.E. Bulletin 80-11”. Visual inspections are performed consistent with techniques identified in industry codes and standards such as ACI 349.3, “Evaluation of Existing Nuclear Safety-Related Concrete Structures,” and ANSI/ASCE 11-90, “Guideline for Structural Condition Assessment of Existing Buildings.”

Enhancements to the Masonry Wall Program include program document revisions that will be credited for license renewal and include the following:

- Identify structures with masonry walls within the scope of license renewal.
- Clarify inspector qualification requirements to align with industry standard.

These enhancements will be implemented prior to the period of extended operation.

A.1.33 Structures Monitoring Program

The Structures Monitoring Program includes periodic inspection and monitoring of the condition of accessible areas of structures. The Structures Monitoring Program implements the requirements of 10 CFR 50.65, the Maintenance Rule that incorporates the guidance of Nuclear Regulatory Commission Regulatory Guide 1.160, and NUMARC 93-01. The Structures Monitoring Program provides inspection guidelines and walkdown checklist for concrete features, roofs, structural steel, masonry walls, seismic gaps, tanks, earthen structures, buried piping, and miscellaneous components such as doors.

Enhancements to the Structures Monitoring Program include program document revisions that will be credited for license renewal and include the following:

- Identify all structures and structural components within the scope of license renewal.
- Identify all applicable aging effects and mechanisms to be inspected.
- Include examinations to representative samples of below-grade concrete when excavated for any reason.
- Clarify inspector qualification requirements to align with industry standard.

These enhancements will be implemented prior to the period of extended operation.

A.1.34 Inspection of Water-Control Structures Program

The Inspection of Water-Control Structures program manages age related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect water-control structures. The program is included in the Structures Monitoring Program that implements the structures monitoring requirements of 10 CFR 50.65. The program includes inservice inspection and surveillance activities for dams, slopes, canals, and other water-control structures.

Enhancements to the Inspection of Water-Control Structures Program include program document revisions that will be credited for license renewal and include the following:

- Ensure that required structures and structural components within the scope of license renewal are identified.
- Include special inspections following the occurrence of large floods, earthquakes, tornados, and intense rainfall.

This enhancement will be implemented prior to the period of extended operation.

A.1.35 Environmental Qualification Program

The EQ Program is imposed by 10 CFR 50.49. The EQ Program manages thermal, radiation, and cyclical aging for components subject to 10 CFR 50.49 requirements through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. Components subject to 10 CFR 50.49 requirements not qualified for the license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation.

This program will be implemented for Unit 1 prior to the period of extended operation.

A.1.36 Fatigue Monitoring Program

The Fatigue Monitoring Program is used for management of metal fatigue of select components in the reactor coolant pressure boundary and primary containment. It provides for monitoring fatigue stress cycles to ensure that the design fatigue usage factor limit is not exceeded.

This program will be enhanced to use EPRI Licensed FatiguePro© Cycle Counting and Fatigue Usage Tracking Computer Program prior to the period of extended operation.

A.2 PLANT SPECIFIC AGING MANAGEMENT PROGRAMS

A.2.1 Systems Monitoring Program

The Systems Monitoring Program is an existing plant specific program that consists of the appropriate ten elements described in Appendix A of NUREG-1800. The BFN Systems Monitoring Program is a condition monitoring program that includes periodic visual inspections of systems' and components' material condition, operation, and configuration. System visual inspections identify degraded conditions prior to the loss of the systems' and components' intended function.

A.2.2 Bus Inspection Program

The Bus Inspection Program is a new program that will provide reasonable assurance that the intended functions of isolated and nonsegregated phase bus will be maintained consistent with the current licensing basis through the period of extended operation. This program will manage nonsegregated phase bus insulation exposed to adverse localized environments caused by heat in the presence of oxygen and loosening of fastening hardware associated with isolated and nonsegregated phase bus due to cyclic loading resulting in thermal expansion and contraction of the bus. The program will also include inspection of the bus enclosure. This program will manage all portions of isolated and nonsegregated phase bus, within the scope of license renewal, associated with the unit station service transformers, main transformers, and common station service transformers.

This new program will be implemented prior to the period of extended operation.

A.2.3 Diesel Starting Air Program

The Diesel Starting Air Program includes:

(a) Preventive actions - Filter and desiccant replacement minimizes corrosion and corrosion product buildup.

(b) Condition monitoring - Periodic inspections verify the effectiveness of the preventive actions and detect and correct degraded conditions prior to loss of function.

The Diesel Starting Air Program is implemented by the Preventive Maintenance Program. The frequencies for replacements and inspections are established and maintained in accordance with the Preventive Maintenance Program. An inspection of the diesel starting air piping and receivers for loss of material will be performed using the One-Time Inspection Program.

This program will be enhanced to perform One-Time Inspections of air piping and receivers for loss of material prior to the period of extended operation.

A.3 TIME-LIMITED AGING ANALYSIS SUMMARIES

As part of the application for a renewed license, 10 CFR 54.21(c) requires an evaluation of TLAAs for the period of extended operation. The following TLAAs have been identified and evaluated to meet this requirement.

A.3.1 Neutron Embrittlement of the Reactor Vessel and Internals

The ferritic materials of the reactor vessel are subject to embrittlement due to high energy neutron exposure. Reactor vessel neutron embrittlement is a TLAA. The following TLAA discussions are related to the issue of neutron embrittlement:

- Reactor Vessel Materials Upper-Shelf Energy Reduction Due to Neutron Embrittlement
- Adjusted Reference Temperature for Reactor Vessel Materials Due to Neutron Embrittlement
- Reflood Thermal Shock Analysis of the Reactor Vessel
- Reflood Thermal Shock Analysis of the Reactor Vessel Core Shroud
- Reactor Vessel Thermal Limit Analysis: Operating Pressure–Temperature Limits
- Reactor Vessel Circumferential Weld Examination Relief
- Reactor Vessel Axial Weld Failure Probability

A.3.1.1 Reactor Vessel Materials Upper-Shelf Energy Reduction due to Neutron Embrittlement

10 CFR 50 Appendix G requires the predicted end-of-life Charpy impact test upper shelf energy for reactor vessel materials to be at least 50 ft-lb (absorbed energy), unless an approved analysis supports a lower value. The upper shelf energy is the standard industry parameter used to indicate the maximum toughness of a material at high temperature. The 60 year end-of-life upper shelf energy was evaluated for the BFN reactor vessels by using an equivalent margin analysis methodology approved by the NRC in NEDO-32205-A, “10 CFR 50 Appendix C Equivalent Margin Analysis for Low Upper-Shelf Energy in BWR-2 Through BWR-6 Vessels." The results show that the limiting upper shelf energy equivalent margin analysis percent is less than the EPRI Report TR-113596, BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Inspection and Flaw Evaluation Guidelines (BWRVIP-74) equivalent margin analysis percent acceptance criterion in all cases, and is therefore acceptable.

A.3.1.2 Adjusted Reference Temperature for Reactor Vessel Materials due to Neutron Embrittlement

10 CFR 50 Appendix G defines the fracture toughness requirements for the life of the reactor pressure vessel. The initial nil-ductility reference temperature (RT_{NDT}) is the temperature at which a non-irradiated metal (ferritic steel) changes in fracture characteristics going from ductile to brittle behavior. An increase (ΔRT_{NDT}) means that higher temperatures are required for the material to continue to act in a ductile manner. The adjusted reference temperature (ART) is defined as $RT_{NDT} + \Delta RT_{NDT}$ + margin. The 60 year end-of-life ΔRT_{NDT} for each BFN reactor pressure vessel beltline materials was calculated based on the embrittlement correlation found in Regulatory Guide 1.99. The calculation results show that the limiting 60 year end-of-life ARTs allow pressure-temperature limits that will provide reasonable operational flexibility.

A.3.1.3 Reflood Thermal Shock Analysis of the Reactor Vessel

The UFSAR section **3.3.5** includes an end-of-life thermal shock analysis performed on the reactor vessels for a design basis LOCA followed by a low pressure coolant injection. The effects of embrittlement assumed by this thermal shock analysis will change with an increase in the licensed operating period. A revised analysis shows that the minimum temperature predicted for the thermal shock event at the time and location of peak stress intensity remains well above the limiting adjusted reference temperature (ART) during the period of extended operation.

A.3.1.4 Reflood Thermal Shock Analysis of the Reactor Vessel Core Shroud

The reactor vessel core shrouds were evaluated for a low pressure coolant injection reflood thermal shock transient considering the embrittlement effects of 40-year radiation exposure (32 EFPY, Effective Full Power Year). The analysis was revised for the 60-year radiation exposure using the approved fluence methodology described in Section A.3.1.2. The results show that the calculated thermal shock strain at the most irradiated location is acceptable considering the embrittlement effects for a 60-year operating period.

A.3.1.5 Reactor Vessel Thermal Limit Analyses: Operating Pressure-Temperature Limits (P-T)

10 CFR Part 50 Appendix G requires reactor vessel thermal limit analyses to determine operating pressure-temperature limits for heatup, cooldown, criticality, and inservice leakage and hydrostatic testing. Because of the relationship between the operating pressure-temperature limits and the fracture toughness transition of the reactor vessel, all three units will require new operating pressure-temperature limit curves to be calculated and approved for the extended period of operation.

A.3.1.6 Reactor Vessel Circumferential Weld Examination Relief

Units 2 and 3 have received relief[1] from reactor vessel circumferential weld examination requirements under Generic Letter 98-05 for the remainder of the 40 year licensed operating period. The circumferential weld examination relief analyses are based on probabilistic assessments that predict an acceptable probability of failure per reactor operating year. The analysis is based on reactor vessel metallurgical conditions as well as flaw indication sizes and frequencies of occurrence that are expected at the end of a licensed operating period.

Although a conditional failure probability has not been recalculated, an analysis that concluded values at the end of a 60 year life are less than the 64 EFPY value provided by the NRC leads to the conclusion that the BFN reactor vessel conditional failure probability is bounded by the NRC analysis in its safety evaluation report (SER) for BWRVIP-05.[2] The procedures and training used to limit cold over-pressure events will be the same as that approved by the NRC when BFN requested the BWRVIP-05 technical alternative be used for the current term for Units 2 and 3. An extension of this relief for the 60-year period will be submitted to the NRC for approval prior to entering the period of extended operation.

A.3.1.7 Reactor Vessel Axial Weld Failure Probability

The BWRVIP-05 recommendations for inspection of reactor vessel shell welds contain generic analyses supporting an NRC SER[3] conclusion that the generic plant axial weld failure rate is no more than 5×10^{-6} per reactor year. BWRVIP-05 showed that this axial weld failure rate of 5×10^{-6} per reactor year is orders of magnitude greater than the 40-year end-of-life circumferential weld failure probability, and used this analysis to justify relief from inspection of the circumferential welds as described in A.3.1.6. The Units 2 and 3 limiting weld chemistry, chemistry factor and 60 year life mean RT_{NDT} values are within the limits of the values assumed in the analysis performed by the NRC staff in its BWRVIP-05 SER supplement[4]. Therefore, the probability of failure for the axial welds is bounded by the NRC evaluation.

1 NRC letter to TVA, "Browns Ferry Nuclear Plant Unit 2, Relief Request 2-ISI-9, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA8424)," 11/18/1999, and
NRC letter to TVA, "Browns Ferry Nuclear Plant Unit 3, Relief Request 3-ISI-1, Revision 1, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC No. MA5953)," 11/18/1999

2 NRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, "Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report," (TAC No. M93925), July 28, 1998.

3 NRC letter from Gus C. Lainas to Carl Terry, Niagara Mohawk Power Company, BWRVIP Chairman, "Final Safety Evaluation of the BWRVIP Vessel and Internals Project BWRVIP-05 Report," (TAC No. M93925), July 28, 1998

4 NRC letter from Jack R. Strosnider, to Carl Terry, BWRVIP Chairman, "Supplement to Final Safety Evaluation of the BWR Vessel and Internals Project BWRVIP-05 Report," (TAC No. MA3395), March 7, 2000

A.3.2 Metal Fatigue

The following thermal and mechanical fatigue analyses of mechanical components have been identified as TLAAs.

- Reactor Vessel Fatigue Analysis
- Reactor Vessel Internals Fatigue Analysis
- Reactor Coolant Pressure Boundary Piping and Component Fatigue Analysis
- Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)

A.3.2.1 Reactor Vessel Fatigue Analysis

Reactor vessel fatigue analyses of the vessel support skirt, shell, upper and lower heads, closure flanges, nozzles and penetrations, nozzle safe ends, and closure studs, depend on assumed numbers and severity of normal and upset-event pressure and thermal operating cycles to predict end-of-life fatigue usage factors. These assumed cycle counts and fatigue usage factors are based on 40 years of operation. Calculation of fatigue usage factors is part of the current licensing basis and is used to support safety determinations.

The fatigue cumulative usage factors (CUF) for the limiting components have been reevaluated for the period of extended operation. For Unit 1, all CUFs are less than the ASME Code allowable for 60 years. For Units 2 and 3, several components have 60-year CUFs greater than the ASME Code allowable of 1.0.

The Fatigue Monitoring Program (A.1.36) will ensure that fatigue effects will be adequately managed and will be maintained within code design limits for the period of extended operation.

A.3.2.2 Reactor Vessel Internals Fatigue Analysis

Fatigue analysis of the reactor internals was performed using the ASME Boiler and Pressure Vessel Code, Section III, as a guide. The most significant fatigue loading occurs at the jet pump diffuser to baffle plate weld location. Additionally, BFN Unit 3 performed a repair at the core spray T-box to address cracking and replaced a lower section of the core spray line and fatigue analyses were performed using ASME III as a guide.

The jet pump diffuser to baffle plate weld and the T-Box repair fatigue analyses were reevaluated and remain acceptable for a 60 year life. The lower sectional replacement, design life was specified as 40 years. Since the modification was installed more than 20 years into the current license, the fatigue analysis remains valid for the period of extended operation. The fatigue analyses of the reactor internal components are acceptable for the period of extended operation.

A.3.2.3 Reactor Coolant Pressure Boundary Piping and Component Fatigue Analysis

The reactor coolant pressure boundary (RCPB) was designed to USAS B31.1-1967. The non-RCPB piping in the scope of license renewal was also designed to USAS B31.1-1967. While this code did not require fatigue analyses, it does require the application of a stress range reduction factor to the allowable stress range for expansion stresses to account for cyclic thermal conditions. A stress range reduction factor of 1.0 is used for the analysis of this piping. Using a stress range reduction factor of 1.0 is applicable when there are 7,000 or less equivalent full-temperature thermal cycles.

The applicability of using a stress range reduction factor of 1.0 for 60 years of plant operation was evaluated. The results of this evaluation indicate that the 7000 thermal cycle assumption is valid and bounding for 60 years of operation. The existing piping analyses within the scope of license renewal containing the assumed thermal cycle counts are valid for the period of extended operation.

A.3.2.4 Effects of Reactor Coolant Environment on Fatigue Life of Components and Piping (Generic Safety Issue 190)

Generic Safety Issue 190 was identified by the NRC staff because of concerns about the potential effects of reactor water environments on component fatigue life during the period of extended operation. Plant specific evaluations were performed for the locations identified in NUREG/CR-6260. For each of these locations, environmental fatigue calculations were performed using the appropriate Environmental Fatigue Life Correction Factor (F_{en}) relationships for carbon/low alloy steels from NUREG/CR-6583 and stainless steels from NUREG/CR-6704. The locations which have projected CUF values greater than 1.0 will be included in the Fatigue Monitoring Program (A. 1.36).

A.3.3 Environmental Qualification of Electrical Equipment

The analyses that establish a qualified life of at least forty years for electrical components subject to the requirements of 10 CFR 50.49 are TLAAs. The aging effects of electrical components subject to the requirements of 10 CFR 50.49 will be managed in the EQ Program in accordance with the requirements of 10 CFR 54.21(c)(1)(iii).

A.3.4 Containment Fatigue

The BFN Torus Integrity Long-Term Program Plant Unique Analysis Report describes the fatigue analyses for the suppression chamber, torus vents, torus downcomers, torus attached pipe, and main steam relief valve discharge lines. The fatigue analyses considered the effects to 500 main steam relief valve actuations during 40 years of normal operation followed by small, intermediate, or design basis pipe break discharges into the suppression pool. Reanalyses were performed to determine the effects of the extended period of operation. Since the 60 year cumulative usage factors were extrapolated to exceed 0.66 for the downcomer/vent header intersection, fatigue will be managed by the Fatigue Monitoring Program (A.1.36). Specifically, main steam safety relief valve lifts will be monitored to ensure that corrective actions are taken before cumulative usage factors approach 1.0.

The design life of the torus vent line and process penetration bellows is 7000 cycles. The number of cycles expected on these bellows has been conservatively approximated by the number of reactor vessel thermal cycles (UFSAR **4.2.5**). The expected number of fatigue cycles expected for the 60 year plant life is a small fraction of the design cycles. Fatigue of the torus vent line and process penetration bellows has been dispositioned by confirming that the analyses remain valid for the period of extended operation.

A.3.5 Other Plant Specific Time-Limited Aging Analysis

TVA has evaluated the following to be plant specific TLAAs:

- A.3.5.1 Reactor Building Crane Load Cycles
- A.3.5.2 Corrosion Allowances
- A.3.5.3 Radiation Degradation of Drywell Expansion Gap Foam
- A.3.5.4 Dose to Seal Rings to the HPCI and RCIC Containment Isolation Check Valves
- A.3.5.5 Irradiation Assisted Stress Corrosion Cracking of Reactor Vessel Internals
- A.3.5.6 Stress Relaxation of the Core Plate Hold-Down Bolts
- A.3.5.7 Emergency Equipment Cooling Water Weld Flaw Evaluation

A.3.5.1 Reactor Building Crane Load Cycles

The reactor building overhead crane is designed to meet the design loading requirements of the Crane Manufacturers Association of America (CMAA) Specification 70. For cyclic loading, CMAA 70 specifies that a crane classified as Service Class A1 is limited to 100,000 loading cycles (i.e., 100,000 lifts at rated capacity) over the design life. The 60-year cycle estimate is less than 1,000 cycles at rated capacity and less than 21,000 lift cycles total. The reactor building crane has been evaluated and is qualified for the period of extended operation.

A.3.5.2 Corrosion Allowances

A.3.5.2.1 Flow Reduction

Carbon steel piping used in raw water systems exhibits increasing surface roughness due to general and localized corrosion.

TVA will manage the corrosion of carbon steel piping in raw water systems using the Open-Cycle Cooling Water System Program (A.1.16) and the Fire Water System Program (A.1.22).

A.3.5.2.2 Minimum Wall Thickness

Corrosion/erosion results in decreasing pipe wall thickness. Corrosion/erosion induced wall thinning will be managed by the applicable aging management programs.

A.3.5.3 Radiation Degradation of Drywell Expansion Gap Foam

The steel drywell shell is enclosed in reinforced concrete for shielding purposes to provide additional resistance to deformation and buckling of the drywell over areas where the concrete backs up the steel shell. Above the transition zone, the drywell is separated from the reinforced concrete by a gap of approximately 2 inches. This gap is filled with polyurethane foam. As described in UFSAR **5.2.3.2**, irradiation tests have shown that no change in the resilient characteristics will take place for exposures up to 10^8 Rads. The effect of a postulated increase in the foam stiffness resulting from radiation dose is a TLAA.

Because the analysis shows that predicted exposure will be less than half of the qualified radiation exposure, the material properties of the foam will remain within the limits assumed by the original design analysis, in accordance with the aging assumptions assumed by the original design, for the period of extended operation.

A.3.5.4 Dose to Seal Rings for the High Pressure Coolant Injection and Reactor Core Isolation Cooling Containment Isolation Check Valves

Analyses for the radiation dose qualification life of elastomeric pressure boundary seals for primary containment isolation valves on the High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) Systems' injection lines into the feedwater system have been projected to the end of the period of extended operation to ensure the validity of assumptions for ECCS system leakage stated in UFSAR **14.6.3.5**.

A.3.5.5 Irradiation Assisted Stress Corrosion Cracking of Reactor Vessel Internals

Austenitic stainless steel reactor vessel internal components exposed to a neutron fluence greater than 5×10^{20} n/cm^2 (E > 1 MeV) are considered susceptible to irradiation assisted stress corrosion cracking (IASCC) in the BWR environment. Fluence calculations have been performed for the reactor vessel and internals. Four components have been identified as being susceptible to IASCC for the period of extended operation: (1) Top Guide; (2) Shroud; (3) Core Plate and (4) In-core Instrumentation Dry Tubes and Guide Tubes. Three components (top guide, shroud and in-core instrumentation dry tubes and guide tubes) have been evaluated by the BWRVIP, as described in the Inspection and Evaluation Guidelines for each component: BWRVIP-26 (Top Guide), BWRVIP-76 (Shroud), and BWRVIP-47 (in-core instrumentation dry tubes and guide tubes). BFN implements the BWRVIP recommendations. The Chemistry Program and the BWR Vessel Internals Program will be used to manage the core plate.

A.3.5.6 Stress Relaxation of the Core Plate Hold-Down Bolts

The core plate hold-down bolts connect the core plate to the core shroud. These bolts are subject to stress relaxation due to thermal and irradiation effects. For the 40-year lifetime, the BWRVIP concluded that all rim hold-down bolts will maintain some preload throughout the life of the plant. For the period of extended operation, further evaluation concluded that the core plate will maintain sufficient preload to prevent sliding under both normal and accident conditions.

A.3.5.7 Emergency Equipment Cooling Water Weld Flaw Evaluation

Analysis was performed on a selected number of EECW system piping welds which have flaws that are larger than normally considered acceptable. The analysis included a stress evaluation of the flawed welds and fatigue crack growth calculations. The fatigue crack growth calculations were based on a conservative projection of 125 cycles. Review of the system operation indicated that the projection of 125 cycles remains valid for the period of extended operation.

BROWNS FERRY NUCLEAR PLANT LICENSE RENEWAL APPLICATION

APPENDIX B

AGING MANAGEMENT PROGRAM DESCRIPTIONS

APPENDIX B TABLE OF CONTENTS

PLANT SPECIFIC PROGRAMS

B.1.0 INTRODUCTION

B.1.1 Overview

License Renewal aging management program descriptions are provided in this appendix for each program credited for managing aging effects based upon the aging management review results provided in Sections 3.1 through 3.6 of this application.

Each aging management program (AMP) described in this Appendix has ten elements which are consistent with the definitions of Table A.1-1, “Elements of an Aging Management Program for License Renewal,” of NUREG-1800. A ten element detailed evaluation is only provided when the program is a plant specific program that is not generically evaluated in NUREG-1801.

During the performance of the Aging Management Review activities, there was recognition that the operating experience on Unit 1 may not be the same as the operating experience on Units 2 and 3 due to the layup program implemented on Unit 1 during its extended outage. Evaluations were performed to identify new aging effects that could be applicable to Unit 1 as a result of the layup environments. For each system evaluated it was concluded that there were no new aging effects requiring management. A summary of the layup program evaluation results are presented in Section **3.0.1**.

B.1.2 Method of Discussion

For those AMPs that are generically evaluated in Sections X and XI of NUREG-1801, 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 about the program.
- Exceptions to the NUREG-1801 program with a justification addressing the elements affected by the exception.
- 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. An evaluation of the impact of the enhancement on affected program elements is provided. A proposed schedule for completion is provided.
- Operating experience information specific to the program at BFN.
- A conclusion statement of reasonable assurance that the program is effective, or will be effective, once enhanced.

For those programs that are not generically evaluated in NUREG-1801, the above format is followed with the additional discussion of each of the ten elements.

B.1.3 Quality Assurance and Administrative Controls

The BFN Quality Assurance Program implements the requirements of 10 CFR 50 Appendix B and is consistent with the summary in Appendix A.2 of NUREG-1800. The Quality Assurance Program includes the elements of corrective action, confirmation process, and administrative controls. The BFN Quality Assurance Program is applicable to the safety-related and nonsafety-related systems, structures, and components that are subject to aging management. Existing corrective action administrative control activities are adequate for managing aging effects during the period of extended operation. The following three elements of the BFN Quality Assurance Program are applicable to license renewal activities as follows:

Element 7 Corrective Actions:

The overall objectives of the Corrective Action Program are to:

- Improve plant performance.
- Provide all employees with an effective method for raising issues with equipment, programs, or processes that may affect safety, regulatory compliance, reliability, or human performance.
- Assure that priorities and resources are properly aligned based on significance of the issue and provide root cause determination and prevention of recurrence in a timely manner.
- Clarify and reinforce standards.
- Provide a means to collect data for trend analysis.

The Corrective Action Program establishes the processes, requirements, and responsibilities for documenting and resolving problems, including adverse conditions. The program is designed to address problems in a manner consistent with the nature of the condition and its importance to plant safety, personnel safety, or plant reliability. The program applies to all TVA Nuclear and to non-TVA Nuclear organizations involved in nuclear power activities. A single corrective action program is applied regardless of the safety classification of the structure or component. Corrective actions are implemented through the initiation of a Problem Evaluation Report in accordance with the TVA Nuclear procedure established in response to 10 CFR 50 Appendix B.

The initiation of a Problem Evaluation Report is required for actual or potential problems, including unexpected plant equipment degradation, damage, failure, malfunction or loss. Site procedures that implement aging management activities for license renewal require that a Problem Evaluation Report be prepared whenever non-conforming conditions are found (e.g., acceptance criteria are not met).

Equipment deficiencies are corrected through the initiation of a Work Order in accordance with plant procedures. Although equipment deficiencies may initially be documented by a Work Order, the corrective action process requires that a Problem Evaluation Report also be initiated if required.

Element 8 Confirmation Process:

The confirmation process ensures that follow-up actions are taken to verify effective implementation of corrective actions. The measure of effectiveness is that adverse conditions are corrected and that repetition of significant conditions is precluded. The TVA nuclear corrective action procedure includes provisions for timely evaluation of adverse conditions and implementation of any corrective actions required, including root cause determinations and prevention of recurrence where appropriate. The procedure requires tracking, coordinating, monitoring, reviewing, verifying, validating, and approving corrective actions to ensure effective corrective actions are taken. The corrective action process also requires monitoring for potentially adverse trends. The existence of an adverse trend due to recurring or repetitive adverse conditions requires initiation of a Problem Evaluation Report.

Since the same 10 CFR 50 Appendix B corrective action program and confirmation process is applied for nonconforming safety-related and nonsafety-related structures and components subject to an AMR for license renewal, the corrective action program is consistent with the NUREG-1801, Table A.1-3, Elements 7 and 8.

Element 9 Administrative Controls:

TVA nuclear administrative controls for the BFN procedure process provide requirements that ensure that BFN activities affecting quality are prescribed by documented instructions, procedures, or drawings of a type appropriate to the circumstances and are accomplished in accordance with these instructions, procedures, or drawings. AMPs are implemented through this process.

Since the same 10 CFR 50 Appendix B procedures process is used to develop AMP procedures and processes, the administrative controls for the development and implementation of AMPs is consistent with the NUREG-1801 elements.

B.1.4 Operating Experience

A comprehensive review of industry and plant specific operating experience was performed to ensure the completeness of aging management reviews and the efficiency of existing AMPs or planned enhancements for the management of identified aging effects. Relevant plant-specific and industry operating experience will be incorporated into the development of new AMPs.

B.1.4.1 Industry Operating Experience

The industry operating experience review captured documents in the following categories from January 1999 until July 2003. Also captured were those prior to 1999 if they were identified in NUREG-1801, aging management industry tools, or they were referenced in other documents which were reviewed.

Generic NRC documents:

- Generic Letters
- Generic Safety Issues
- IE Bulletins
- Information Circulars
- Information Notices
- Regulatory Information Summaries

Licensee and Non-Regulatory Agency documents authored by the following organizations:

- INPO
- EPRI
- NUMARC
- NEI

The industry operating experience review consisted of a detailed review to determine if there was an aging issue identified. If an issue was identified, it was evaluated to determine if there was an aging effect not previously identified in industry operating experience. There were no previously unidentified aging effects identified.

B.1.4.2 Plant Specific Operating Experience

Review of plant specific operating experience was performed to identify aging effects experienced and to determine the effectiveness of existing AMPs. The plant specific review focused on Work Orders, Problem Evaluation Reports, Licensee Event Reports, and System Health Reports. A summary of the methodology and results follows:

Problem Evaluation Reports and Work Orders

1. An electronic search using key words appropriate for the identification of aging effects and aging management program effectiveness was performed on the Work Order (WO) database for the period of January, 1995 until July 2003. There were approximately ninety thousand (90,000) WOs searched. Approximately seventeen thousand (17,000) WOs contained one or more of the key words. These WOs were further reviewed to remove WOs involving out of scope SSCs and/or active components. This review identified slightly over eleven thousand (11,000) WOs that required additional review
2. An electronic search using key words appropriate for the identification of aging effects and aging management program effectiveness was performed on the Problem Evaluation Report (PER) (corrective action program documents) database for the period of January,1995 until July 2003. There were approximately twenty-five thousand (25,000) PERs searched. This review identified slightly over six thousand, five hundred (6,500) PERs that contained one or more of the key words that required additional review.
3. These remaining Work Orders and Problem Evaluation Reports were reviewed to determine if there was an aging effect not previously identified in industry operating experience. No previously unidentified aging effects were identified.

Documentation of plant specific experience prior to 1995 for significant events that could impact aging effects was also evaluated. These included:

- Operating experience associated with the Unit 1 layup program (Section **3.0.1**).
- Reports of the effects and corrective actions for the fire that occurred in the Unit 2 control bay in 1976. TVA has concluded that there is no time-limited aging analyses (TLAA) nor is there any aging effects unique to the fire that need to be managed during the period of extended operation other than those already identified.

Licensee Event Reports

Each Licensee Event Report from January 1, 1995 until July 31, 2003 was reviewed to determine if there was an aging issue identified. If an issue was identified, it was evaluated to determine if there was an aging effect not previously identified in industry operating experience. TVA did not identify any previously unidentified aging effects during this review.

System Health Reports

System Health Reports were manually screened to determine if there were any aging issues identified. If an issue was identified, it was evaluated to determine if there was an aging effect not previously identified in industry operating experience. There were no previously unidentified aging effects identified.

System Health Reports are generated by System Engineers for each quarter for common, Unit 2 and Unit 3 systems. The System Health Reports identify system problems and trends.

Plant Personnel Interfaces

The operating experience summaries contained in the program descriptions were reviewed by plant system engineering personnel and program owners. The operating experience review provides objective evidence that the effects of aging at BFN have been and will continue to be adequately managed.

B.1.5 Aging Management Programs

The following AMPs are described in this appendix. Programs are identified as either existing or new. They are further identified as being consistent or not consistent with the program description and evaluation of NUREG-1801, Vol. 2.

Section	Title	New or Existing	Consistent with NUREG-1801
B.2.1.1	Accessible Non-Environmental Qualification Cables and Connections Inspection Program	New	Yes
B.2.1.2	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program	Existing	No
B.2.1.3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program	New	Yes
B.2.1.4	ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program	Existing	Yes
B.2.1.5	Chemistry Control Program	Existing	No
B.2.1.6	Reactor Head Closure Studs Program	Existing	Yes
B.2.1.7	Boiling Water Reactor Vessel Inside Diameter Attachment Welds Program	Existing	Yes
B.2.1.8	Boiling Water Reactor Feedwater Nozzle Program	Existing	Yes
B.2.1.9	Boiling Water Reactor Control Rod Drive Return Line Nozzle Program	Existing	Yes
B.2.1.10	Boiling Water Reactor Stress Corrosion Cracking Program	Existing	Yes
B.2.1.11	Boiling Water Reactor Penetrations Program	Existing	Yes
B.2.1.12	Boiling Water Reactor Vessel Internals Program	Existing	Yes
B.2.1.13	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program	N/A	N/A
B.2.1.14	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program	Existing	Yes
B.2.1.15	Flow-Accelerated Corrosion Program	Existing	Yes

Section	Title	New or Existing	Consistent with NUREG-1801
B.2.1.16	Bolting Integrity Program	Existing	No
B.2.1.17	Open-Cycle Cooling Water Program	Existing	Yes
B.2.1.18	Closed-Cycle Cooling Water System Program	Existing	Yes
B.2.1.19	Boraflex Monitoring Program	N/A	N/A
B.2.1.20	Inspection of Overhead Heavy Load and Light Load Handling Systems Program	Existing	No
B.2.1.21	Compressed Air Monitoring Program	Existing	Yes
B.2.1.22	BWR Reactor Water Cleanup System Program	Existing	Yes
B.2.1.23	Fire Protection Program	Existing	No
B.2.1.24	Fire Water System Program	Existing	No
B.2.1.25	Buried Piping and Tanks Surveillance Program	N/A	N/A
B.2.1.26	Aboveground Carbon Steel Tanks Program	Existing	Yes
B.2.1.27	Fuel Oil Chemistry Program	Existing	No
B.2.1.28	Reactor Vessel Surveillance Program	Existing	Yes
B.2.1.29	One-Time Inspection Program	New	Yes
B.2.1.30	Selective Leaching of Materials Program	New	Yes
B.2.1.31	Buried Piping and Tanks Inspection Program	Existing	Yes
B.2.1.32	ASME Section XI Subsection IWE Program	Existing	No
B.2.1.33	ASME Section XI Subsection IWF Program	Existing	No
B.2.1.34	10 CFR 50 Appendix J Program	Existing	Yes
B.2.1.35	Masonry Wall Program	Existing	Yes
B.2.1.36	Structures Monitoring Program	Existing	Yes
B.2.1.37	Inspection of Water-Control Structures Program	Existing	Yes
B.2.1.38	Protective Coating Monitoring And Maintenance Program	N/A	N/A
B.2.1.39	Systems Monitoring Program	Existing	N/A
B.2.1.40	Bus Inspection Program	New	N/A
B.2.1.41	Diesel Starting Air Program	Existing	N/A

B.1.6 Time Limited Aging Analyses Aging Management Programs

The following Time Limited Aging Analyses AMPs are described in the listed sections listed in this appendix. Programs are identified as either existing or new. They are further identified as being consistent or not consistent with the program description and evaluation of NUREG-1801, Vol. 2.

Section	Title	New or Existing	Consistent with NUREG-1801
B.3.1	Environmental Qualification Program	Existing	Yes
B.3.2	Fatigue Monitoring Program	Existing	Yes
B.3.3	Concrete Containment Tendon Prestress Program	N/A	N/A

B.2.0 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 Volume 2 Chapter XI programs and the BFN programs are shown below. Links to appropriate sections of this appendix are provided.

NUREG-1801 Program Number	NUREG-1801 Program Name	BFN Program Name
XI.E1	Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Accessible Non-EQ Cables and Connections Inspection Program (B.2.1.1)
XI.E2	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits (B.2.1.2)
XI.E3	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements (B.2.1.3)
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection, Program (B.2.1.4)
XI.M2	Water Chemistry	Chemistry Control (B.2.1.5)
XI.M3	Reactor Head Closure Studs	Reactor Head Closure Studs (B.2.1.6)
XI.M4	BWR Vessel ID Attachment Welds	Boiling Water Reactor Vessel ID Attachment Welds (B.2.1.7)
XI.M5	BWR Feedwater Nozzle	Boiling Water Reactor Feedwater Nozzle (B.2.1.8)
XI.M6	BWR Control Rod Drive Return Line Nozzle	Boiling Water Reactor Control Rod Drive Return Nozzle (B.2.1.9)
XI.M7	BWR Stress Corrosion Cracking	Boiling Water Reactor Stress Corrosion Cracking (B.2.1.10)
XI.M8	BWR Penetrations	Boiling Water Reactor Penetrations (B.2.1.11)
XI.M9	BWR Vessel Internals	Boiling Water Reactor Vessel Internals (B.2.1.12)
XI.M10	Boric Acid Corrosion	PWR program. Not Applicable to BFN.

NUREG-1801 Program Number	NUREG-1801 Program Name	BFN Program Name
XI.M11	Nickel-Alloy Nozzles and Penetrations	PWR program. Not Applicable to BFN.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	None. Evaluation provided in (**B.2.1.13**)
XI.M13	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel (CASS) (**B.2.1.14**)
XI.M14	Loose Part Monitoring	PWR program. Not Applicable to BFN.
XI.M15	Neutron Noise Monitoring	PWR program. Not Applicable to BFN.
XI.M16	PWR Vessel Internals	PWR program. Not Applicable to BFN.
XI.M17	Flow-Accelerated Corrosion Program test	Flow-Accelerated Corrosion (**B.2.1.15**)
XI.M18	Bolting Integrity	Bolting Integrity (**B.2.1.16**)
XI.M19	Steam Generator Tube Integrity	PWR program. Not Applicable to BFN.
XI.M20	Open-Cycle Cooling Water System	Open-Cycle Cooling Water System Program (**B.2.1.17**)
XI.M21	Closed-Cycle Cooling Water System	Closed-Cycle Cooling Water System (**B.2.1.18**)
XI.M22	Boraflex Monitoring	None. Evaluation provided in (**B.2.1.19**)
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load Handling Systems (**B.2.1.20**)
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring (**B.2.1.21**)
XI.M25	BWR Reactor Water Cleanup System	BWR Reactor Water Cleanup System (**B.2.1.22**)
XI.M26	Fire Protection	Fire Protection (**B.2.1.23**)
XI.M27	Fire Water System	Fire Water System (**B.2.1.24**)
XI.M28	Buried Piping and Tanks Surveillance	None. Evaluation provided in (**B.2.1.25**)
XI.M29	Aboveground Carbon Steel Tanks	Aboveground Carbon Steel Tanks (**B.2.1.26**)
XI.M30	Fuel Oil Chemistry	Fuel Oil Chemistry (**B.2.1.27**)

NUREG-1801 Program Number	NUREG-1801 Program Name	BFN Program Name
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance (**B.2.1.28**)
XI.M32	One-Time Inspection	One-Time Inspection (**B.2.1.29**)
XI.M33	Selective Leaching of Materials	Selective Leaching of Materials (**B.2.1.30**)
XI.M34	Buried Piping and Tanks Inspection	Buried Piping and Tanks Inspection (**B.2.1.31**)
XI.S1	ASME Section XI Subsection IWE	ASME Section XI Subsection IWE (**B.2.1.32**)
XI.S2	ASME Section XI Subsection IWL	Not Applicable to BFN. BFN does not have a reinforced or prestressed concrete containment.
XI.S3	ASME Section XI Subsection IWF	ASME Section XI Subsection IWF Program (**B.2.1.33**)
XI.S4	10 CFR Part 50, Appendix J	10 CFR Part 50, Appendix J (**B.2.1.34**)
XI.S5	Masonry Wall Program	Masonry Wall (**B.2.1.35**)
XI.S6	Structures Monitoring Program	Structures Monitoring (**B.2.1.36**)
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	Inspection of Water-Control Structures (**B.2.1.37**)
XI.S8	Protective Coating Monitoring and Maintenance Program	None. Evaluation provided in (**B.2.1.38**)
N/A	BFN specific program	System Monitoring (**B.2.1.39**)
N/A	BFN specific program	Bus Inspection Program (**B.2.1.40**)
N/A	BFN specific program	Diesel Starting Air Program (**B.2.1.41**)

B.2.1 Aging Management Program Descriptions

B.2.1.1 Accessible Non-Environmental Qualification Cables and Connections Inspection Program

Program Description

The Accessible Non-Environmental Qualification (EQ) Cables and Connections Inspection Program is a new program that will be structured to provide reasonable assurance that the intended functions of insulated cables and connections within the scope of license renewal exposed to adverse localized environments will be maintained consistent with the current licensing basis through the period of extended operation.

Development of this program will consider the technical information and guidance provided in NUREG/CR-5643, “Insights Gained From Aging Research,” IEEE Standard 1205, “IEEE Guide for Assessing, Monitoring, and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Power Generating Stations,” SAND96-0344, “Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations,” EPRI TR-109619, “Guideline for the Management of Localized Equipment Environments," EPRI 1003057, “License Renewal Electrical Handbook,” and the Westinghouse Owners Group Aging Assessment Field Guide.

A sample of non-EQ insulated cables and connections will be inspected by this program and will include power, instrumentation, control, and communication applications located in accessible adverse localized environments throughout the plant that perform a function consistent with that defined by 10 CFR 54.4. Only those cables and connections that can be approached and directly viewed will be inspected. Connections include connectors, splices, electrical penetration assembly pigtails and sealants, terminal blocks, and fuse blocks. If an unacceptable condition or situation is identified for a cable or connection in the inspection sample, a determination will be made as to whether the same condition or situation is applicable to other accessible or inaccessible cables or connections.

The aging mechanisms addressed in this program include heat and radiation in the presence of oxygen. The aging effects associated with these mechanisms include embrittlement, cracking, melting, discoloration, swelling, or loss of dielectric strength leading to reduced insulation resistance or electrical failure preventing the component from performing its intended function.

The Accessible Non-EQ Cables and Connections Inspection Program is a condition monitoring program that will be implemented prior to entering the period of extended operation. The first inspection will be performed prior to entering the period of extended operation. Inspections will be performed at least once every 10 years thereafter.

NUREG-1801 Consistency

The Accessible Non-EQ Cables and Connections Inspection Program is a new program that will be consistent with the program described in NUREG-1801 Section XI.E1 evaluation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

This is a new AMP. Therefore no operating experience exists.

Conclusion

The implementation of the Accessible Non-EQ Cables and Connections Inspection Program will provide reasonable assurance that the applicable aging effects will be effectively managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.2 Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program

Program Description

The Electrical Cables Not Subject To 10 CFR 50.49 Environmental Qualification Requirements Used In Instrumentation Circuits Program is an existing program that manages the aging effects of sensitive, low-level signal circuits exposed to adverse localized environments caused by heat or radiation. Aging effects of the Local Power Range Monitor[1] cable systems are managed by this program.

Technical Specification Requirements (3.3.1.1.7) impose calibration requirements on the Neutron Monitoring Local Power Range Monitor circuits. The results of the calibrations will be reviewed to identify the potential existence of cable degradation. When a Local Power Range Monitor circuit is found to be out of calibration, corrective actions will be implemented. Calibrations will continue through the period of extended operation at the required frequency as specified in the BFN Technical Specifications.

NUREG-1801 Consistency

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits program will credit existing Technical Specifications requirements and, with the following exception, will meet the intent of the program described in NUREG-1801 Section XI.E2.

Exceptions

BFN performs a calibration procedure that implements Technical Specifications requirements. The procedure is not a normal loop calibration. The procedure utilizes actual detector signals during normal operation for calibration inputs.

Program Element Affected:

Element 3 – Parameters Monitored or Inspected

"The parameters monitored are determined from the plant technical specifications and are specific to the instrumentation loop being calibrated, as documented in the surveillance test procedure."

BFN Evaluation

This program will monitor parameters that are required by Technical Specifications and are specific to the LPRM cable system being calibrated.

1 Aging effects for in-scope Radiation Monitoring system cables are managed by the BFN Environmental Qualification Program described in Section **B.3.1**.

Element 4 – Detection of aging effects

"Calibration provides sufficient indication of the need for corrective actions by monitoring key parameters and providing trending data based on acceptance criteria related to instrumentation loop performance. The normal calibration frequency specified in the plant technical specifications provides reasonable assurance that severe aging degradation will be detected prior to loss of the cable intended function. The first tests for license renewal are to be completed before the period of extended operation."

BFN Evaluation

Routine calibration results will provide adequate and timely indication of the need for corrective actions by monitoring key parameters related to Local Power Range Monitor cable system performance. The normal calibration frequency specified in Technical Specifications provides reasonable assurance that severe aging degradation will be detected prior to loss of the cable intended function. Calibrations will continue through the period of extended operation at the required frequency as specified in the BFN Technical Specifications.

Enhancements

None

Operating Experience

Industry operating experience was reviewed to identify aging effects and mechanisms that could challenge the intended function of components and systems within the scope of this program. Review of plant specific operating experience was also performed to identify aging effects experienced. Neither review identified any new aging effects.

Conclusion

The Electrical Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits Program provides reasonable assurance that the applicable aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.3 Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program

Program Description

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will manage the aging effects of inaccessible medium-voltage cables that are not subject to the environmental qualification requirements of 10 CFR 50.49 and are exposed to adverse localized environments caused by moisture while energized.

This program will consider the technical information and guidance provided in NUREG/CR-5643, "Insights Gained From Aging Research ," IEEE Std. 1205, "IEEE Guide for Assessing, Monitoring and Mitigating Aging Effects on Class 1E Equipment Used in Nuclear Power Generating Stations," SAND96-0344, "Aging Management Guideline for Commercial Nuclear Power Plants - Electrical Cable and Terminations ," EPRI TR-109619, "Guideline for the Management of Adverse Localized Equipment Environments," and EPRI TR-103834-P1-2, "Effects of Moisture on the Life of Power Plant Cables".

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a condition monitoring program in which medium voltage cables that are installed in underground conduit duct banks and that perform an intended function within the scope of license renewal (such as the medium-voltage cables to the Residual Heat Removal Service Water pumps) will be tested 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. The test will be as described in EPRI TR-103834-P1-2 or will be a test that is state-of-the-art at the time of program implementation.

The first tests in the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will be implemented prior to entering the period of extended operation and will be performed at least once every 10 years thereafter.

NUREG-1801 Consistency

The Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program is a new program that will be consistent with the program described in NUREG-1801 Section XI.E3 evaluation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

This is a new AMP. Therefore, no operating experience exists.

Conclusion

The implementation of the Inaccessible Medium Voltage Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Program will provide reasonable assurance that the applicable aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.4 ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program

Program Description

10 CFR 50.55a imposes the inservice inspection requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code Section XI for Class 1, 2, and 3 pressure-retaining components and their integral attachments in light-water cooled power plants. The BFN ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program includes periodic visual, surface, and/or volumetric examination of Class 1, 2, and 3 pressure-retaining components and their integral attachments. Requirements for the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program are mandated by the BFN Technical Requirements Manual 3.4.3, "Structural Integrity."

As required by 10 CFR 50.55a paragraph (g)(4)(ii), the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program will incorporate the requirements of the latest edition and addenda of the ASME B&PV Code incorporated by reference in 10 CFR 50.55a paragraph (b), 12 months prior to the start of each 120-month inspection interval, subject to the limitations and modifications listed in 10 CFR 50.55a paragraph (b), and with alternatives as authorized by the NRC in accordance with 10 CFR 50.55a paragraph (a)(3) or (g)(6).

Inspection of Class 1, 2, and 3 pressure-retaining components and their integral attachments covered in ASME Section XI, Subsections IWB, IWC, and IWD respectively, is performed in accordance with the 1974 edition through the 1975 addenda for Unit 1, with portions of this code upgraded to the 1995 edition through the 1996 addenda. For Unit 2, inspections are performed in accordance with 1995 edition through the 1996 addenda and the 1989 edition for Unit 3, with portions of this code upgraded to the 1995 edition through the 1996 addenda.

Technical Requirements Manual 3.4.3 requires additional inspections of certain piping welds to provide added protection against pipe whip.

The ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program for piping welds is a Risk-Informed program, thus modifying the frequency requirements of the ASME B&PV Code Section XI. The BFN Risk Informed ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program was approved by the NRC for Unit 3 in NRC letter (ML003682680) with SER to TVA, "BFN Unit 3, ASME B&PV Code Relief For Risk-Informed Inservice Inspection of Piping (TAC NO. MA5355)," dated February 11, 2000 and for Unit 2 in NRC letter (ML010190294) with SER to TVA, "BFN Unit 2, and ASME B&PV Code Relief for Risk-Informed Inservice Inspection of Piping (TAC N0. MA8873)," dated January 19, 2001. The basis for risk informing the ASME Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program is not a TLAA based on the periodic updates required by 10 CFR 50.55a and reaffirmed by both TVA and the NRC during the approval process for the current 10 year inspection interval.

The ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program is described in UFSAR **4.12**, “Inservice Inspection and Testing”.

NUREG-1801 Consistency

The ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program is an existing program that is consistent with NUREG-1801 XI.M1 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program in accordance with Subsections IWB, IWC, or IWD has been shown to be generally effective in managing aging effects in Class 1, 2, or 3 components and their integral attachments.

BFN has successfully identified indications of age related degradation prior to the loss of the functions of the components, and has taken appropriate corrective actions through evaluation, repair or replacement of the components in accordance with ASME Section XI and station implementing procedures.

Conclusion

The continued implementation of the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.5 Chemistry Control Program

Program Description

The main objective of the Chemistry Control Program is to minimize loss of material due to general, crevice, and pitting corrosion and crack initiation and growth caused by stress corrosion cracking. The Chemistry Control Program is consistent with and relies on monitoring and control of water chemistry based on guidelines in the Boiling Water Reactor Vessel and Internals Project (BWRVIP)-79, "BWR Water Chemistry Guidelines - 2000 Revision" (EPRI Report TR-103515-R2, February 2000). BWRVIP-79 has guidelines for reactor water, condensate and feedwater, for control rod drive cooling water, and other systems such as spent fuel pool water.

The BFN Chemistry Control Program includes periodic monitoring, control, and mitigation of known detrimental contaminants below the levels known to result in corrosion and stress corrosion crack initiation and growth.

In addition, BFN has established a Hydrogen Water Chemistry program which has been shown to be an effective method of mitigating Intergranular Stress Corrosion Cracking.

Requirements for Reactor Coolant Chemistry are mandated by Technical Requirements Manual 3.4.1, "Coolant Chemistry". Requirements for Spent Fuel Pool Water are mandated by Technical Requirements Manual 3.9.3, "Spent Fuel Pool Water Chemistry".

NUREG-1801 Consistency

The BFN Chemistry Control Program is an existing program that takes exceptions to NUREG-1801 XI.M2 evaluation elements and requires enhancement to be consistent with other NUREG-1801 XI.M2 evaluation elements.

Exceptions to NUREG-1801

<u>Exception 1</u>

NUREG-1801 recommends that water chemistry be controlled in accordance with BWRVIP-29. BWRVIP-29 references the 1993 revision of EPRI Report TR-103515, "BWR Water Chemistry Guidelines". The BFN Chemistry Control Program is based on BWRVIP-79 EPRI Report TR-103515-R2, which is the 2000 Revision of "BWR Water Chemistry Guidelines".

> <u>Program Elements Affected</u>
>
> Element 1 - Scope of Program
>
> "The program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides (Pressurized Water Reactors (PWRs) only), dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or crack initiation and growth. Water chemistry control is in

accordance with the guidelines in BWRVIP-29 (EPRI TR-103515) for water chemistry in BWRs; EPRI TR-105714, Rev. 3, for primary water chemistry in pressurized water reactors (PWRs); EPRI TR-102134, Rev. 3, for secondary water chemistry in PWRs; or later revisions or updates of these reports as approved by the staff."

BFN Evaluation

EPRI periodically updates the water chemistry guidelines, as new information becomes available. EPRI TR-103515-R2 incorporates new information to develop proactive plant-specific water chemistry programs to minimize intergranular stress corrosion cracking (IGSCC).

In the "License Renewal Safety Evaluation Report for the Peach Bottom Atomic Power Station, Units 2 and 3" (Accession No. ML030370189), the NRC found EPRI TR-103515-R2 acceptable because the program is based on updated industry experience and plant-specific and industry-wide operating experience confirms the effectiveness of the RCS chemistry program. The BFN units are similar to the Peach Bottom units. Therefore the NRC conclusion reached for Peach Bottom is applicable to BFN.

Exception 2

NUREG-1801 indicates that hydrogen peroxide is monitored to mitigate degradation of structural materials. The BFN Chemistry Control Program does not monitor for hydrogen peroxide because the rapid decomposition of hydrogen peroxide makes reliable data exceptionally difficult to obtain and EPRI TR-103515-R2 Section 4.3.3, "Water Chemistry Guidelines for Power Operation," does not address monitoring for hydrogen peroxide.

Program Elements Affected

Element 3 - Parameters Monitored or Inspected

"The concentration of corrosive impurities listed in the EPRI guidelines discussed above, which include chlorides, fluorides (PWRs only), sulfates, dissolved oxygen, and hydrogen peroxide, are monitored to mitigate degradation of structural materials. Water quality (pH and conductivity) is also maintained in accordance with the guidance. Chemical species and water quality are monitored by in process methods or through sampling. The chemistry integrity of the samples is maintained and verified to ensure that the method of sampling and storage will not cause a change in the concentration of the chemical species in the samples. The guidelines in BWRVIP-29 (EPRI TR-103515) for BWR reactor water recommend that the concentration of chlorides, sulfates, and dissolved oxygen are monitored and kept below the recommended levels to mitigate corrosion. The two impurities, chlorides and sulfates, determine the coolant conductivity; dissolved oxygen, hydrogen peroxide, and hydrogen determine electrochemical potential (ECP). The EPRI guidelines recommend that the coolant conductivity and ECP are also monitored and kept below the recommended levels to mitigate SCC and corrosion in BWR plants.

The EPRI guidelines in BWRVIP-29 (TR-103515) for BWR feedwater, condensate, and control rod drive water recommends that conductivity, dissolved oxygen level, and concentrations of iron and copper (feedwater only) are monitored and kept below the recommended levels to mitigate SCC. The EPRI guidelines in BWRVIP-29 (TR-103515) also include recommendations for controlling water chemistry in auxiliary systems: torus/pressure suppression chamber, condensate storage tank, and spent fuel pool."

Element 8 - Confirmation Process

"Following corrective actions, additional samples are taken and analyzed to verify that the corrective actions were effective in returning the concentrations of contaminants such as chlorides, fluorides, sulfates, dissolved oxygen, and hydrogen peroxide to within the acceptable ranges. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable in addressing the confirmation process."

BFN Evaluation

BFN has determined that monitoring hydrogen peroxide is impractical and provides unreliable data; therefore, the BFN Chemistry Control Program does not monitor for hydrogen peroxide.

Enhancements

The BFN Chemistry Control Program procedure is written to address all three units (Unit 1, Unit 2, and Unit 3). However, Unit 1 must implement the latest revision to EPRI TR-103515-R2 Guidelines prior to the period of extended operation.

Program Elements Affected

Element 1 - Scope of Program

"The program includes periodic monitoring and control of known detrimental contaminants such as chlorides, fluorides (PWRs only), dissolved oxygen, and sulfate concentrations below the levels known to result in loss of material or crack initiation and growth. Water chemistry control is in accordance with the guidelines in BWRVIP-29 (EPRI TR-103515) for water chemistry in BWRs; EPRI TR-105714, Rev. 3, for primary water chemistry in PWRs; EPRI TR-102134, Rev. 3, for secondary water chemistry in PWRs; or later revisions or updates of these reports as approved by the staff."

BFN Evaluation

With the implementation of this enhancement and with the exceptions noted above, the BFN Chemistry Control Program will be consistent with the affected program element for all three units.

Operating Experience

The EPRI guideline documents have been developed based on plant experience and have been shown to be effective over time with their widespread use in the industry. The specific examples of BWR industry operating experience are as follows:

- Intergranular stress corrosion cracking has occurred in small and large-diameter BWR piping made of austenitic stainless steels and nickel-base alloys.
- Significant cracking has occurred in recirculation, core spray, residual heat removal, and reactor water cleanup systems' piping welds.
- IGSCC has also occurred in a number of vessel internal components, including the core shroud, access hole cover, top guide, and core spray spargers.
- No occurrence of stress corrosion cracking (SCC) in piping and other components in standby liquid control systems exposed to sodium pentaborate solution has ever been reported.

As chemistry control guidelines were evolving in the industry, BFN experience with reactor coolant system chemistry was similar to that of the industry. Cracking due to IGSCC was found in reactor recirculation, reactor water cleanup, and jet pump instrumentation system piping.

The BFN Chemistry Control Program is based on EPRI TR-103515-R2 (BWRVIP-79), which is the 2000 Revision of "BWR Water Chemistry Guidelines". EPRI periodically updates the water chemistry guidelines, as new information becomes available. The BFN Chemistry Program has incorporated new EPRI information to develop a proactive water chemistry program to minimize IGSCC.

Conclusion

The continued implementation of the BFN Chemistry Control Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.6 Reactor Head Closure Studs Program

Program Description

The BFN Reactor Head Closure Studs Program includes:

(a) Inservice inspection in conformance with the requirements of the ASME B&PV Code Section XI Subsection IWB, Table IWB 2500-1 (**B.2.1.4**).

(b) Preventive measures to mitigate cracking. The preventive measures of Regulatory Guide 1.65, "Materials and Inspections for Reactor Vessel Closure Studs," have been implemented. Approved lubricants minimize the potential for cracking of the non-metal-plated reactor head closure studs.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is an existing program that is consistent with NUREG-1801 XI.M3 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Stress Corrosion Cracking has occurred in BWR reactor head closure studs, particularly metal plated studs. The approved lubricants used have proven to be effective in preventing seized studs or nuts.

The BFN reactor head closure studs are not metal plated. With the lack of metal plating and preventive use of approved lubricants, the Reactor Head Closure Studs Program has been effective in reducing the probability of stress corrosion cracking of the reactor head closure studs.

Conclusion

The continued implementation of the Reactor Head Closure Studs Program provides reasonable assurance that the aging effects will be managed so that the components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.7 Boiling Water Reactor Vessel Inside Diameter Attachment Welds Program

Program Description

The BWR Vessel ID Attachment Welds Program includes:

(a) Inspection and flaw evaluation in accordance with the guidelines of staff-approved boiling water reactor vessel and internals project BWRVIP-48, BWR Vessel and Internals Project, “Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines,” (EPRI Report TR-108724), February 1998 (**F.6**).

Inspections and flaw evaluations are performed by the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**).

(b) Monitoring and control of water chemistry in accordance with the guidelines of BWRVIP-79, “BWR Water Chemistry Guidelines - 2000 Revision” (EPRI Report TR-103515-R2,) February 2000, to ensure the long-term integrity and safe operation of the reactor vessel inside diameter attachment welds. Monitoring and control of reactor coolant water chemistry is performed by the Chemistry Control Program (**B.2.1.5**).

NUREG-1801 Consistency

The BWR Vessel ID Attachment Welds Program is an existing program that requires enhancement to be consistent with NUREG-1801 XI.M4 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

The BWRVIP guidelines will be implemented on Unit 1 prior to the period of extended operation.

Program Elements Affected

Element 5 - Monitoring and Trending

“Inspections scheduled in accordance with IWB-2400 and approved BWRVIP-48 guidelines provide timely detection of cracks. If flaws are detected, the scope of examination is expanded.”

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element for all three units.

Operating Experience

The BWR Pressure Vessel ID Weld inspection program incorporates all susceptible welds. The inspections are based on BFN operating experience, industry operating experience and various BWRVIP/EPRI Guidelines. The program schedules inspections, evaluates any flaws detected, and provides for repair or replacement as appropriate. The program, as implemented, has adequately managed the reactor vessel ID attachment welds.

Conclusion

The continued implementation of the BWR Vessel ID Attachment Welds Program provides reasonable assurance that crack initiation and growth will be adequately managed and the intended functions of the vessel ID attachment welds will be maintained consistent with the current licensing basis for the period of extended operation.

B.2.1.8 Boiling Water Reactor Feedwater Nozzle Program

Program Description

The BFN Boiling Water Reactor Feedwater Nozzle program includes:

(a) An inservice inspection in accordance with the requirements of the ASME B&PV Code Section XI Subsection IWB (**B.2.1.4**) and the recommendations of General Electric NE-523-A71-0594, “Alternate BWR Feedwater Nozzle Inspection Requirements”.

(b) System modifications to mitigate cracking. The program addressed BWR feedwater nozzle cracking by implementation of the recommendations of NUREG-0619,”BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking.” The BFN feedwater nozzles have been modified to mitigate cracking by removing the stainless steel cladding and machining the safe end and nozzle bore and inner bend radius to accept improved double-piston-ring interference-fit spargers with a forged tee design and orificed elbow discharges. The reactor water cleanup system return lines are routed to both feedwater headers (except Unit 2 which is only routed to one feedwater header). In addition, changes to plant-operating procedures, such as improved feedwater control, to decrease the magnitude and frequency of temperature fluctuations have been implemented.

NUREG-1801 Consistency

The BWR Feedwater Nozzle Program is an existing program that requires enhancement to be consistent with NUREG-1801 XI.M5 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

The Unit 1 operating procedures will be upgraded to decrease the magnitude and frequency of feedwater temperature fluctuations. This enhancement will be implemented prior to the period of extended operation.

Program Elements Affected:

Element 2 - Preventive Actions

"Mitigation occurs by systems modifications, such as removal of stainless steel cladding and installation of improved spargers. Mitigation is also accomplished by changes to plant-operating procedures, such as improved feedwater control and rerouting of the reactor water cleanup system, to decrease the magnitude and frequency of temperature fluctuations."

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element for all three units.

Operating Experience

During their early years of operation in the 1970s, the BFN reactors experienced feedwater nozzle cracking. After implementation of the recommendations of NUREG-0619, BFN has operated without significant feedwater nozzle issues.

The BFN experience is consistent with the experience of other BWRs that began operation in the same time frame.

Conclusion

The continued implementation of the BWR Feedwater Nozzle program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.9 Boiling Water Reactor Control Rod Drive Return Line Nozzle Program

Program Description

The BWR Control Rod Drive Return Line Nozzle Program includes:

(a) An inservice inspection in accordance with the ASME B&PV Code Section XI Subsection IWB. This inspection requirement is implemented by the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**).

(b) System modifications to mitigate cracking. The control rod drive return lines have been modified to meet the recommendations of NUREG-0619,"BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking". The control rod drive return lines now return to the reactor water cleanup system piping. The control rod drive return line reactor vessel nozzle piping has been removed and the reactor vessel nozzles have been capped.

NUREG-1801 Consistency

The BWR Control Rod Drive Return Line Nozzle Program is an existing program that is consistent with NUREG-1801 XI.M6 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

After implementation of the recommendations of NUREG-0619, BFN has operated for over twenty years with no significant control rod drive return line reactor vessel nozzle issues.

Conclusion

The continued implementation of the BWR Control Rod Drive Return Line Nozzle program provides reasonable assurance that the aging effects will be managed so that the components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.10 Boiling Water Reactor Stress Corrosion Cracking Program

Program Description

The BWR Stress Corrosion Cracking Program manages intergranular stress corrosion cracking in reactor coolant pressure boundary components made of stainless steel. The program includes:

(a) Preventive measures to mitigate intergranular stress corrosion cracking. The comprehensive program outlined in NRC GL 88-01 and NUREG-0313 and in the staff approved BWRVIP-75 has been implemented. This comprehensive program addresses the mitigating measures for stress corrosion cracking and intergranular stress corrosion cracking. Preventive methodologies include piping replacement with IGSCC resistant stainless steel. Preventive measures have included heat sink welding, induction heating, and mechanical stress improvement. The BFN Chemistry Control Program (**B.2.1.5**) controls water chemistry within parameters that prevent, minimize, and mitigate intergranular stress corrosion cracking.

(b) Inspection and flaw evaluation to monitor intergranular stress corrosion cracking and its effects. The staff-approved BWRVIP-75 report allows for modifications of inspection scope in the GL 88-01 program. The ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**) detects degradation including intergranular stress corrosion.

The BWR Stress Corrosion Cracking Program is consistent with NUREG-0313, "Technical Report on Material Selection and Processing Guidelines for BWR Coolant Pressure Boundary Piping," Revision 2, BWRVIP 75, "Technical Basis for Revisions to Generic Letter 88-01 Inspection Schedules," and Nuclear Regulatory Commission Generic Letter 88-01, "NRC Position on Intergranular Stress Corrosion Cracking in BWR Austenitic Stainless Steel Piping," and its Supplement 1 (**F.5**).

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking Program is an existing program that requires enhancements to be consistent with NUREG-1801 XI.M7 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

The BWR Stress Corrosion Cracking Program will be implemented on Unit 1 prior to the period of extended operation.

Program Elements Affected

Element 1 – Scope of Program

"The program focuses on (a) managing and implementing countermeasures to mitigate IGSCC and (b) performing inservice inspection (ISI) to monitor IGSCC and its effects on the intended function of BWR components. The program is applicable to all BWR piping made of austenitic SS that is 4 in. or larger in nominal diameter and contains reactor coolant at a temperature above 93°C (200°F) during power operation, regardless of code classification. The program also applies to pump casings, valve bodies and reactor vessel attachments and appurtenances, such as head spray and vent components. NUREG-0313 and NRC GL -88-01, respectively, describe the technical basis and staff guidance regarding mitigation of IGSCC in BWRs. Attachment A of NRC GL 88-01 delineates the staff-approved positions regarding materials, processes, water chemistry, weld overlay reinforcement, partial replacement, stress improvement of cracked welds, clamping devices, crack characterization and repair criteria, inspection methods and personnel, inspection schedules, sample expansion, leakage detection, and reporting requirements."

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program elements for all these units.

Operating Experience

BFN, as well as most of the BWR fleet of reactors, has experienced intergranular stress corrosion cracking of austenitic stainless steel piping.

The implementation of the comprehensive program outlined in NRC GL 88-01 and NUREG-0313 and in the staff approved BWRVIP-75, including the Water Chemistry Program (**B.2.1.5**) has been effective in managing IGSCC.

The BFN ISI Program has been shown to be effective at identifying the aging effects of SCC and IGSCC so that repairs or replacements are implemented prior to failure.

Conclusion

The continued implementation of the BWR Stress Corrosion Cracking program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.11 Boiling Water Reactor Penetrations Program

Program Description

The BWR Penetrations program includes:

(a) Inspection and flaw evaluation in conformance with the guidelines of NRC staff-approved BWRVIP-49[2], "Instrument Penetration Inspection and Flaw Evaluation Guidelines," and BWRVIP-27[3], "BWR Standby Liquid Control System/Core Plate Delta-P Inspection and Flaw Evaluation Guidelines," documents (**F.6**).

Inspection and flaw evaluation is conducted in accordance with the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4** and **A.1.4**), which has incorporated the BWRVIP-27 and BWRVIP-49 guidelines. Required repairs or replacements implement the recommendations of NRC staff-approved BWRVIP-53[4] and BWRVIP-57[5] into procedures which are performed in accordance with ASME Section XI repair and replacement requirements.

(b) Monitoring and control of reactor coolant water chemistry. BFN has implemented an effective water chemistry control program to mitigate stress corrosion cracking and intergranular stress corrosion cracking. (**B.2.1.5**)

NUREG-1801 Consistency

The BWR Penetrations Program is an existing program that requires enhancement to be consistent with NUREG-1801 XI.M8 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

The BWRVIP guidelines will be implemented on Unit 1 prior to the period of extended operation.

2 Approved with SER in ML990908019, 09/01/99
3 Approved with SER in ML993630179, 12/20/99
4 Approved with SER in ML003764491, 10/26/2000
5 Approved with SER in ML021270435, 05/07/2002

Program Elements Affected

Element 2 - Preventive Actions

“Maintaining high water purity reduces susceptibility to SCC or IGSCC. Reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29 (EPRI TR-103515). The program description and the evaluation and technical basis of monitoring and maintaining reactor water chemistry are presented in Chapter XI.M2, “Water Chemistry.”

Element 3 - Parameters Monitored or Inspected

“The program monitors the effects of SCC/IGSCC on the intended function of the component by detection and sizing of cracks by ISI in accordance with the guidelines of approved BWRVIP-49 or BWRVIP-27 and the requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI Table IWB 2500-1 (1995 edition through the 1996 addenda). An applicant may use the guidelines of BWRVIP-62 for inspection relief for vessel internal components with hydrogen water chemistry.”

Element 4 – Detection of Aging Effects

“The evaluation guidelines of BWRVIP-49 and BWRVIP-27 recommend that the inspection requirements currently in ASME Section XI continue to be followed. The extent and schedule of the inspection and test techniques prescribed by the ASME Section XI program are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function of the component. Inspection can reveal crack initiation and growth and leakage of coolant. The nondestructive examination techniques appropriate for inspection of BWR vessel internals and their implementation needs, including the uncertainties inherent in delivering and executing NDE techniques in a BWR are included in BWRVIP-03.

Instrument penetrations and standby liquid control (SLC) system nozzles or housings are inspected in accordance with the requirements of ASME Section XI Subsection IWB. Components are examined and tested as specified in Table IWB-2500-1, examination categories B-E for pressure-retaining partial penetration welds in vessel penetrations, B-D for full penetration nozzle-to-vessel welds, B-F for pressure-retaining dissimilar metal nozzle-to-safe end welds, or B-J for similar metal nozzle-to-safe end welds. In addition, these components are part of examination category B-P for pressure-retaining boundary. Further details for examination are described in Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD” of this report”.

Element 5 - Monitoring and trending

“Inspections scheduled in accordance with IWB-2400 and approved BWRVIP-48 or BWRVIP-27 provide timely detection of cracks. The scope of examination expansion and reinspection beyond the baseline inspection are required if flaws are detected.”

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program elements for all three units.

Operating Experience

BFN and other BWRs have experienced cracking due to SCC or IGSCC in components made of austenitic stainless steels and nickel alloys.

The BFN Chemistry Control Program (**B.2.1.5**) has been effective in managing IGSCC.

The BFN ISI program has been shown to be effective at identifying the aging effects from SCC and IGSCC.

Conclusion

The continued implementation of the BWR Penetrations program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.12 Boiling Water Reactor Vessel Internals Program (F.12)

Program Description

The BWR Vessel Internals aging management program includes:

(a) Inspection in accordance with the ASME B&PV Code Section XI Subsections IWB, IWC, and IWD Inservice Inspection Program (**B.2.1.4**) and inspection and flaw evaluation in conformance with the guidelines of the following applicable boiling water reactor vessel and internals project (BWRVIP) documents.

(b) Monitoring and control of reactor coolant water chemistry (**B.2.1.5**) in accordance with the guidelines of BWRVIP-79 (EPRI Report TR-103515 - 2000 revision) helps ensure the long-term integrity and safe operation of boiling water reactor vessel internal components.

BFN is relying upon BWRVIP-74, approved by the NRC for referencing in License Renewal applications. See Section **3.1.2.2.16** for an explanation of the BFN completion of the SERs action items (**F.6**).

BWRVIP Inspection and Flaw Evaluation Reference[6]	NRC SER Date and Accession No.
BWRVIP-03, Reactor Pressure Vessel and Internals Examinations Guidelines	ML012670353, 09/21/01
BWRVIP-05, “Reactor Vessel Shell Weld Inspection Guidelines” September 1995	ML003690281, 03/07/00
BWRVIP-18, “BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines,” July 1996	ML003775973, 12/07/00
BWRVIP-25, “BWR Core Plate Inspection and Flaw Evaluation Guidelines, “ December, 1996	ML003775989, 12/07/00
BWRVIP-26, “BWR Top Guide Inspection and Flaw Evaluation Guidelines,” December, 1996	ML003776810, 12/07/00
BWRVIP-27-A, “BWR Standby Liquid Control System/Core Plate ΔP Inspection and Flaw Evaluation Guidelines,” April 2003	ML993630179, 12/20/99
BWRVIP-38, “BWR Shroud Support Inspection and Flaw Evaluation Guidelines,” September, 1997	ML010600211, 03/01/01
BWRVIP-41, “BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines,” October 1997	ML011310322, 06/15/01
BWRVIP-47, “BWR Lower Plenum Inspection and Flaw Evaluation Guidelines,” December 1997	ML003775765, 12/07/00
BWRVIP-48, “Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines,” February 1998	ML010180493, 01/17/01

6 BWRVIP-42 is not applicable to BFN. BFN is a BWR-4 whose low pressure coolant injection function of the Residual Heat Removal system injects into the Reactor Recirculation system discharge lines rather than injecting directly into the reactor vessel.

BWRVIP Inspection and Flaw Evaluation Reference	**NRC SER Date and Accession No.**
BWRVIP-49, "Instrument Penetration Inspection and Flaw Evaluation Guidelines Final Report (BWRVIP-49-A)," March 2002	09/01/99
BWRVIP-74-A, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines, June 2003	ML012920549, 10/18/01
BWRVIP-76, BWR Core Shroud Inspection and Flaw Evaluation Guidelines, November 1999	Not issued[7]

Most of the SERs listed in (a) above have actions items that must be addressed. The first three actions in most of the SERs are common. BFN's position for each of these common actions is:

Action 1

"The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the [BWRVIP No.] report to manage the effects of aging on the functionality of the [components addressed in the report] during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the AMPs within the [BWRVIP No.] report described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the reactor vessel components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1)."

BFN Response

BFN is bounded by each of the reports. Deviations are addressed as exceptions.

Action 2

"10 CFR 54.21(d) requires that an UFSAR supplement for the facility contain a summary description of the programs and activities for managing the effects of aging and the evaluation of TLAAs for the period of extended operation. Those applicants for license renewal referencing the [BWRVIP No.] report for the [components addressed by the report] shall ensure that the programs and activities specified as necessary in the [BWRVIP No.] report are summarily described in the UFSAR supplement."

7 The NRC review of BWRVIP-76 is not complete. When NRC review of BWRVIP-76 is complete, BFN will evaluate the NRC SER and complete SER Action Items.

BFN Response

The UFSAR supplement references the administrative controls of BWRVIP-94. This provides an acceptable level of regulatory control while eliminating the administrative burden imposed by maintaining discussions of the living BWRVIP program documents in the UFSAR.

As a BWRVIP participant, BFN has accepted the responsibilities and implemented the processes outlined in BWRVIP-94. These controls and process ensure effective regulatory communication and controls. For example, BWRVIP-94 section 3.5, "Reporting" has the following requirement:

> "Each utility will inform the NRC of any decision to not fully implement a BWRVIP guideline approved by the NRC staff within 45 days of the report approval."
>
> "The NRC should be notified if changes are made to the vessel and internals program that affect implementation of the BWRVIP guidelines."
>
> "Flaw evaluations that deviate from the guidance in BWRVIP reports shall be submitted to the NRC for approval."

Action 3

"10 CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. In its Appendix [BWRVIP Report specific] to the [BWRVIP No.] report, the BWRVIP stated that there are no generic changes or additions to technical specifications associated with the [components addressed by the report] as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the [BWRVIP No.] report for the [components addressed by the report] shall ensure that the inspection strategy described in the [BWRVIP No.] report does not conflict with or result in any changes to their technical specifications. If technical specification changes do result, then the applicant must ensure that those changes are included in its application for license renewal."

BFN Response

BFN has identified no technical specification conflicts or changes required to implement the referenced BWRVIP reports' actions and programs during the period of extended operation.

Some of the SERs have specific actions that are addressed as follows:

SER Accession No.	Action Items	BFN Response
ML003690281, BWRVIP-05, Reactor Vessel Shell Weld	"BWR licensees may request relief from the inservice inspection requirements of 10 CFR 55a(g) for volumetric examination of circumferential RPV welds by demonstrating: (1) that at the expiration of a renewed license, the circumferential welds satisfy the limiting conditional failure probability for circumferential welds in this evaluation and	BFN has requested and received[8] relief from the inservice inspection requirements for volumetric examination of circumferential RPV welds. See TLAA in Section 4.2.6 for a demonstration that at the expiration of a renewed license, the circumferential welds satisfy the limiting conditional failure probability in the BWRVIP-05 evaluation.
ML003690281, BWRVIP-05 Reactor Vessel Shell Welds	(2) They have implemented operator training and established procedures that limit the frequency of cold over pressure events to the amount specified in this report."	BFN reaffirms for the period of extended operation the demonstration that was provided in the approved relief requests[9] that operator training has been implemented and procedures have been established that limit the frequency of cold over pressure events to the amount specified in this report.
ML003775973 BWRVIP-18 Core Spray Internals	(4) "Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components."	See Sections 4.3.2 and 4.7 for a discussion of TLAA issues which affect the structural integrity of the subject RPV internal Core Spray components.
ML003775989 BWRVIP-25 Core Plate	(4) "Due to susceptibility of the rim hold-down bolts to stress relaxation, applicants referencing the BWRVIP-25 report for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue."	BFN has addressed stress relaxation of rim hold-down bolts as a TLAA. See Section 4.7.7.

8 NRC letter to BFN, "Browns Ferry Nuclear Plant Unit 2, Relief Request 2-ISI-9, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC NO. MA8424)," 11/18/1999
NRC letter to BFN, "Browns Ferry Nuclear Plant Unit 3, Relief Request 3-ISI-1, Revision 1, Alternatives for Examination of Reactor Pressure Vessel Shell Welds (TAC NO. MA5953)," 11/18/1999

SER Accession No.	Action Items	BFN Response
ML003775989 BWRVIP-25 Core Plate	(5) “Until such time as an expanded technical basis for not inspecting the rim hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts.”	BFN will continue to inspect rim hold-down bolts.
ML003776810 BWRVIP-26 Top Guide	(4) “Due to IASCC susceptibility of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue.”	BFN has addressed IASCC as a TLAA. See Section **4.7.6**.
ML993630179 BWRVIP-27 Standby Liquid Control System/Core Plate ΔP	(4) “Due to the susceptibility if the subject components to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue.”	Fatigue is a TLAA evaluated in Section **4.3**.
ML003775765 BWRVIP-47 Lower Plenum	(4) “Due to fatigue of the subject safety-related components, applicants referencing the BWRVIP-47 report for LR should identify and evaluate the projected CUF as a potential TLAA issue.”	Fatigue is a TLAA evaluated in Section **4.3**.

NUREG-1801 Consistency

The BWR Vessel Internals Program is an existing program that, with enhancements, will be consistent with NUREG-1801 XI.M9 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

The BWRVIP guidelines will be implemented on Unit 1 prior to the period of extended operation.

Program Element Affected:

Element 2 - Preventive Actions

“Maintaining high water purity reduces susceptibility to cracking due to SCC or IGSCC. Reactor coolant water chemistry is monitored and maintained in accordance with the guidelines in BWRVIP-29 (EPRI TR-103515). The program description and evaluation, and technical basis of monitoring and maintaining reactor water chemistry are presented in Chapter XI.M2, “Water Chemistry.”

Element 4 - Detection of aging effects

“The extent and schedule of the inspection and test techniques prescribed by the applicable and approved BWRVIP guidelines are designed to maintain structural integrity and ensure that aging effects will be discovered and repaired before the loss of intended function. Inspection can reveal crack initiation and growth. Vessel internal components are inspected in accordance with the requirements of ASME Section XI Subsection IWB, examination category B-N-2. The ASME Section XI inspection specifies visual VT-1 examination to detect discontinuities and imperfections, such as cracks, corrosion, wear, or erosion, on the surfaces of components. This inspection also specifies visual VT-3 examination to determine the general mechanical and structural condition of the component supports by (a) verifying parameters, such as clearances, settings, and physical displacements, and (b) detecting discontinuities and imperfections, such as loss of integrity at bolted or welded connections, loose or missing parts, debris, corrosion, wear, or erosion.”

Element 5 - Monitoring and trending

"Inspections scheduled in accordance with the applicable and approved BWRVIP guidelines provide timely detection of cracks. The scope of examination expansion and reinspection beyond the baseline inspection are required if flaws are detected."

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program elements for all three units.

Operating Experience

Extensive cracking has been observed in core shrouds at both horizontal (Nuclear Regulatory Commission Generic Letter 94-03) and vertical (NRC Information Notice 97-17) welds. It has affected shrouds fabricated from Type 304 and Type 304L SS, which is generally considered to be more resistant to SCC. Weld regions are most susceptible, although it is not clear whether this is due to sensitization and/or impurities associated with the welds or the high residual stresses in the weld regions. This experience is reviewed in NRC GL 94-03 and NUREG-1544; some experiences with visual inspections are discussed in NRC IN 94-42.

BFN, as well as most of the BWR fleet of reactors, has experienced cracking of reactor pressure vessel internal components.

Conclusion

The continued implementation of the BWR Vessel Internals Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.13 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program

The only in-scope Cast Austenitic Stainless Steel (CASS) components that were determined to be susceptible to thermal aging embrittlement are the main steam line flow restricting venturis. The material of the venturis is low-molybdenum with a delta ferrite content of 18.3%. The venturis are exposed to a reactor steam environment that is significantly less than 320°C (610°F). Based on an evaluation of these material and environmental characteristics in accordance with the guidelines of EPRI Technical Report 1000976, "Evaluation of Thermal Aging Embrittlement for Cast Austenitic Stainless Steel Components - January 2001," a Thermal Aging Embrittlement of CASS aging management program is not required.

B.2.1.14 Thermal Aging and Neutron Irradiation Embrittlement of Cast Austenitic Stainless Steel Program

Program Description

The Thermal Aging and Neutron Irradiation Embrittlement of CASS aging management program monitors the effects of loss of fracture toughness on the intended function of the component by performing supplemental examinations of CASS reactor vessel internals component. The reactor vessel internals receive a visual inspection in accordance with the ASME B&PV Code Section XI Subsection IWB, Category B-N-3 requirements (**B.2.1.4**). Additional enhanced visual inspections that incorporate the requirements of the BWR Vessel Internals Program (**B.2.1.12**) are performed to detect the effects of loss of fracture toughness due to thermal aging and neutron irradiation embrittlement of CASS reactor vessel internals. The enhanced visual inspections include the ability to achieve a 0.0005-in. resolution, with the conditions (e.g., lighting and surface cleanliness) of the inservice examination bounded by those used to demonstrate the resolution of the inspection technique.

NUREG-1801 Consistency

The Thermal Aging and Neutron Irradiation Embrittlement of CASS aging management program is an existing program that requires enhancement to be consistent with the NUREG-1801 XI.M13 evaluation.

Exceptions to NUREG-1801

None

Enhancements

The Thermal Aging and Neutron Irradiation Embrittlement of CASS aging management program will be implemented on Unit 1. The enhancement is scheduled for implementation prior to the period of extended operation.

> <u>Program Element Affected</u>:
>
> Element 1 - Scope of Program
>
> “The program provides screening criteria to determine the susceptibility of CASS components to thermal aging on the basis of casting method, molybdenum content, and percent ferrite. The screening criteria are applicable to all primary pressure boundary and reactor vessel internal components constructed from SA-351 Grades CF3, CF3A, CF8, CF8A, CF3M, CF3MA, CF8M, with service conditions above 250°C (482°F). The screening criteria for susceptibility to thermal aging embrittlement are not applicable to niobium-containing steels; such steels require evaluation on a case-by-case basis. For “potentially susceptible” components, the

program provides for the consideration of the synergistic loss of fracture toughness due to neutron embrittlement and thermal aging embrittlement. For each such component, an applicant can implement either (a) a supplemental examination of the affected component as part of a 10-year ISI program during the license renewal term, or (b) a component-specific evaluation to determine the component's susceptibility to loss of fracture toughness."

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element for all three units.

Operating Experience

Cracking has been detected in the reactor vessel internals at several domestic and overseas boiling water reactors. In June 1994, the BWR Vessel and Internals Project was formed to address integrity issues arising from inservice degradation of reactor vessel internals. Since that time, the BWRVIP has published several reports which present guidelines for inspecting, evaluating, and repairing reactor vessel internals. The BFN Reactor Vessel Internals Program is based on research data obtained from both laboratory-aged and service-aged materials.

BFN does not consider void swelling to be an aging mechanism applicable to BWRs. EPRI TR-107521 addresses data gathered from liquid-metal-cooled fast breeder reactors, and how it may possibly be related to a PWR component (baffle-former bolt) that is in almost direct contact with the fuel in a PWR. A BWR does not have components in a similar location and thus can reasonably be expected to experience less fluence. Past studies of void swelling by ANL, ORNL, HEDL, and GE have shown that the threshold fluence for void swelling is approximately 10^{22} n/cm^2, which is well in excess of the fluence experienced by boiling water reactor CASS components. Secondly, the EPRI report notes that field experience does not suggest that void swelling is a significant issue. The lowest temperature for which this phenomenon is conjectured to occur is 300°C (572°F), which is higher than the temperature experienced by BWR reactor vessel internals.

Conclusion

The continued implementation of the Thermal Aging and Neutron Irradiation Embrittlement of CASS aging management program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.15 Flow-Accelerated Corrosion Program

Program Description

The Flow-Accelerated Corrosion Program was developed in response to NRC Generic Letter 89-08, “Erosion/Corrosion-Induced Pipe Wall Thinning”. The program is based on the guidelines of EPRI NSAC-202L, “Recommendations for an Effective Flow Accelerated Corrosion Program,” Revision 2. The program includes analysis to determine critical locations, baseline inspections to determine the extent of thinning at these locations, and follow-up inspections to confirm the predictions. Repair, replacements, or re-evaluations are performed as necessary.

The Flow-Accelerated Corrosion Program includes the use of a predictive code, CHECWORKS, which is used to predict flow-accelerated corrosion in carbon steel lines containing high-energy fluids (two-phase as well as single-phase systems subject to flow-accelerated corrosion).

NUREG-1801 Consistency

The Flow-Accelerated Corrosion Program is an existing program that, with the following enhancement, will be consistent with the NUREG-1801 XI.M17 evaluation.

Exceptions to NUREG-1801

None

Enhancement

The Flow-Accelerated Corrosion Program will be enhanced to implement NSAC-202L-R2 recommendations for Unit 1 prior the period of extended operation.

Program Elements Affected

Element 1 - Scope of Program

“The FAC program, described by the EPRI guidelines in NSAC-202L-R2, includes procedures or administrative controls to assure that the structural integrity of all carbon steel lines containing high-energy[9] fluids (two phase as well as single phase) is maintained. Valve bodies retaining pressure in these high-energy systems are also covered by the program. The FAC program was originally outlined in NUREG-1344 and was further described through the Nuclear Regulatory Commission (NRC) Generic Letter (GL) 89-08. A program implemented in accordance with the EPRI guidelines predicts, detects, and monitors FAC in plant piping and other components, such as valve bodies, elbows and expanders. Such a program

9 The NRC use of the term “high-energy” differs from its use by TVA. Although TVA would not define a system such as an extraction steam system as a high energy system, TVA does include such systems in its Flow-Accelerated Corrosion Program if they have the potential for causing flow-accelerated corrosion.

includes the following recommendations: (a) conducting an analysis to determine critical locations; (b) performing limited baseline inspections to determine the extent of thinning at these locations; and (c) performing follow-up inspections to confirm the predictions, or repairing or replacing components as necessary. The NSAC-202L-R2 (April 1999) provides general guidelines for the FAC program. To ensure that all the aging effects caused by FAC are properly managed, the program includes the use of a predictive code, such as CHECWORKS, that uses the implementation guidance of NSAC-202L-R2 to satisfy the criteria specified in 10 CFR Part 50, Appendix B, criteria for development of procedures and control of special processes. "

Element 5 - Monitoring and Trending

"CHECWORKS or a similar predictive code is used to predict component degradation in the systems conducive to FAC, as indicated by specific plant data, including material, hydrodynamic, and operating conditions. CHECWORKS is acceptable because it provides a bounding analysis for FAC. CHECWORKS was developed and benchmarked by using data obtained from many plants. The inspection schedule developed by the licensee on the basis of the results of such a predictive code provides reasonable assurance that structural integrity will be maintained between inspections. If degradation is detected such that the wall thickness is less than the minimum predicted thickness, additional examinations are performed in adjacent areas to bound the thinning."

BFN Evaluation

When the enhancement is implemented, the Flow-Accelerated Corrosion Program will be consistent with the affected NUREG-1801 elements for all three BFN units.

Operating Experience

Wall-thinning problems in single-phase systems have occurred in feedwater and condensate systems (NRC IE Bulletin No. 87-01 and NRC Information Notices (INs) 81-28, 92-35, and 95-11), in two-phase piping in extraction steam lines (NRC INs 89-53 and 97-84), and in moisture separator and feedwater heater drains (NRC INs 89-53, 91-18, 93-21, and 97-84) throughout the industry.

TVA experience with its Flow-Accelerated Corrosion Program activities has shown that the program can determine susceptible locations for flow-accelerated corrosion, predict component degradation, and detect wall thinning in components due to flow-accelerated corrosion; thus providing for timely evaluation, repair or replacement prior to loss of intended function. When flow-accelerated corrosion problems have been identified, corrective actions have been taken to prevent recurrence. For example:

Extraction steam, heater drain, and heater vent line piping has experienced wall thinning due to FAC. This piping is being replaced, primarily with FAC resistant materials.

Conclusion

The continued implementation of the Flow-Accelerated Corrosion Program provides reasonable assurance that the aging effects due to flow-accelerated corrosion will be managed such that the piping and components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.16 Bolting Integrity Program

Program Description

The Browns Ferry Bolting Integrity Program provides for condition monitoring of selected pressure retaining bolted joints and external surfaces for piping and components within the scope of license renewal. The Bolting Integrity Program provides for:

(a) Preventive Actions - Plant procedures specify selection of bolting material and the use of lubricants and sealants. The program is consistent with the guidelines of EPRI NP-5769, “Degradation and Failure of Bolting in Nuclear Power Plants,” and the additional recommendations of NUREG-1339, “Resolution of Generic Safety Issue 29: Bolting Degradation or Failure in Nuclear Power Plants,” to prevent or mitigate degradation and failure of safety-related bolting.

(b) Condition monitoring - The BFN Bolting Integrity Program includes inservice inspections of Class 1, 2, and 3 components in accordance with ASME Section XI, Subsections IWB, IWC, and IWD Program (**B.2.1.4**). Inspection for in-scope bolting not included in the ASME Section XI, Inservice Inspection (ISI) Program is provided by the System Monitoring Program (**B.2.1.39**).

The Bolting Integrity Program does not manage aging of bolting that is internal to the reactor vessel or the reactor vessel head closure studs. See descriptions of the BWR Vessel Internals Program (**B.2.1.12**) for bolting that is internal to the reactor vessel and the Reactor Head Closure Studs Program (**B.2.1.6**) for the reactor vessel head closure studs. BFN has not identified any high strength bolts (actual yield strength >150 ksi) used in NSSS component supports.

NUREG-1801 Consistency

The Bolting Integrity Program is an existing program that takes exceptions to NUREG-1801 XI.M18 evaluation elements.

Exceptions to NUREG-1801

Exception 1

NUREG-1801 indicates that the program covers all bolting within the scope of license renewal including structure bolting. The Browns Ferry Bolting Integrity Program does not address structural bolting. The Structures Monitoring Program (**B.2.1.36**) covers aging management of structural bolting.

Exception 2

NUREG-1801 indicates that the program covers all bolting within the scope of license renewal including bolting for Class 1 NSSS component supports. The Browns Ferry Bolting Integrity program does not address Class 1 NSSS component support bolts. Aging management of ASME Section XI Class 1, 2 and 3 (or equivalent) component and piping supports is addressed by the ASME Section XI, Subsection IWF Program (**B.2.1.33**).

Program Elements Affected (Exceptions 1 and 2)

Element 1 - Scope of Program

"The program covers all bolting within the scope of license renewal including safety-related bolting, bolting for NSSS component supports, bolting for other pressure retaining components, and structural bolting. The program covers both greater than and smaller than 2-in. diameter bolting. The Nuclear Regulatory Commission (NRC) staff recommendations and guidelines for comprehensive bolting integrity programs that encompass all safety-related bolting are delineated in NUREG-1339. The industry's technical basis for the program for safety related bolting and guidelines for material selection and testing, bolting preload control, inservice inspection (ISI), plant operation and maintenance, and evaluation of the structural integrity of bolted joints, are outlined in EPRI NP-5769, with the exceptions noted in NUREG 1339. For other bolting, this information is set forth in EPRI TR-104213."

Element 4 – Detection of Aging Effects

"Inspection requirements are in accordance with the American Society of Mechanical Engineers (ASME) Section XI, Table IWB 2500-1 or IWC 2500-1 (1995 edition through the 1996 addenda) and the recommendations of EPRI NP-5769. For Class 1 components, Table IWB 2500-1, examination category B-G-1, for bolting greater than 2 in. in diameter, specifies volumetric examination of studs and bolts and visual VT-1 examination of surfaces of nuts, washers, bushings, and flanges. All high strength bolting used in NSSS component supports are to be inspected also to the requirements for Class 1 components, examination category B-G-1. Examination category B-G-2, for bolting 2 in. or smaller requires only visual VT-1 examination of surfaces of bolts, studs, and nuts. For Class 2 components, Table IWC 2500-1, examination category B-D, for bolting greater than 2 in. in diameter, requires volumetric examination of studs and bolts. Examination categories B-P or C-H require visual examination (IWA-5240) during system leakage testing of all pressure-retaining Class 1 and 2 components, according to Tables IWB 2500-1 and IWC 2500-1, respectively. In addition, degradation of the closure bolting due to crack initiation, loss of prestress, or loss of material due to corrosion of the closure bolting would result in leakage. The extent and schedule of inspections, in accordance with IWB 2500-1 or IWC 2500-1, assure detection of aging degradation before the loss of the intended function of the closure bolting. Structural bolting both inside and outside containment is inspected by visual inspection. Degradation of this bolting may be detected and measured either by removing the bolt, proof test by tension or torquing, by in situ ultrasonic tests, or hammer test. If this bolting is found corroded, a closer inspection is performed to assess extent of corrosion."

BFN Evaluation

Structural bolting is addressed by the Structures Monitoring Program (**B.2.1.36**). Bolting for ASME Section XI Class 1, 2 and 3 (or equivalent) component and piping supports is addressed by the ASME Section XI, Subsection IWF Program (**B.2.1.33**). These AMPs are considered appropriate for managing the aging of these types of bolting.

Enhancements

None

Operating Experience

The BWR fleet of plants, including BFN, has experienced bolting degradation issues. The industry and BFN has implemented a Bolting Integrity Program which has adequately detected bolting integrity issues (degradation of bolting material). The BFN Bolting Integrity Program has been effective at detecting degradation of bolting and corrective actions taken prior to the loss of its intended function. BFN uses no high strength bolts (actual yield strength >150 ksi).

Conclusion

The continued implementation of the Bolting Integrity Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.17 Open-Cycle Cooling Water System Program

Program Description

The Open-Cycle Cooling Water System Program activities manage aging effects caused by corrosion, erosion, biofouling, and silting in raw cooling water piping and components. The program is in accordance with the guidelines of NRC Generic Letter 89-13. The activities for managing aging effects include:

(a) Condition monitoring - System and component testing, visual inspections, and NDE testing are conducted.

(b) Preventive actions - Biocide treatment and filtering are used to prevent loss of material due to microbiologically influenced corrosion (MIC) and biofouling and flow blockage and reduction of heat transfer due to biological and particulate fouling.

BFN does not utilize protective coatings in any raw water systems as addressed in IN 85-24; therefore, protective coating failures do not apply to BFN.

NUREG-1801 Consistency

The Open-Cycle Cooling Water System Program is an existing program that, with enhancements, will be consistent to the NUREG-1801 XI.M20 evaluation.

Exceptions to NUREG-1801

None

Enhancements

The Open-Cycle Cooling Water System Program will be enhanced to implement Generic Letter 89-13 for Unit 1 prior to the period of extended operation.

Program Elements Affected:

Element 1 – Scope of Program

"The guidelines of NRC GL 89-13 include (a) surveillance and control of biofouling; (b) a test program to verify heat transfer capabilities; (c) routine inspection and a maintenance program to ensure that corrosion, erosion, protective coating failure, silting, and biofouling cannot degrade the performance of safety-related systems serviced by OCCW; (d) a system walkdown inspection to ensure compliance with the licensing basis."

BFN Evaluation

With the implementation of the enhancement, the Open-Cycle Cooling Water System Program will be consistent with the affected program elements for all three units.

Operating Experience

BFN has implemented the guidance of NRC GL 89-13 for over 10 years. The Open-Cycle Cooling Water System Program inspection and testing activities have detected and evaluated the presence of biofouling, corrosion, MIC, and silting. Corrective actions were implemented prior to loss of system function. The existing Open-Cycle Cooling Water System Program has been effective in managing aging effects in structures and components serviced by Open Cycle Cooling Water Systems.

The effectiveness of the GL 89-13 implementation has been documented in inspection reports for NRC inspections 2000-05 (Accession No. ML010240205), 2001-01 (Accession No. ML012060002), 2001-05 (Accession No. ML 021140311), and 2003-02 (Accession No. ML031260665).

Conclusion

The continued implementation of the Open-Cycle Cooling Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.18 Closed-Cycle Cooling Water System Program

Program Description

The Closed-Cycle Cooling Water System Program includes:

(a) Preventive measures to minimize corrosion - The program maintains system corrosion inhibitor concentrations within specified limits to minimize corrosion. An inspection in accordance with the One-Time Inspection Program (**B.2.1.29**) will verify the effectiveness of the preventive measures.

(b) Surveillance testing and inspection to monitor the effects of corrosion on the intended function of the component - Surveillance testing and inspections in accordance with standards in EPRI TR-107396 for closed-cycle cooling water systems are performed to evaluate system and component performance.

The Closed-Cycle Cooling Water System Program relies on the guidelines of EPRI Report TR-107396, “Closed Cooling Water Chemistry Guideline (October 1997).”

NUREG-1801 Consistency

The Closed-Cycle Cooling Water System Program is an existing program that, with the following enhancement, will be consistent with the NUREG-1801 XI.M21 evaluation.

Exceptions to NUREG-1801

None

Enhancements

The Closed-Cycle Cooling Water System Program will be enhanced to implement EPRI TR-107396 for Unit 1 prior to the period of extended operation.

Program Elements Affected:

Element 4 - Detection of aging effects

“Control of water chemistry does not preclude corrosion at locations of stagnant flow conditions or crevices. Degradation of a component due to corrosion would result in degradation of system or component performance. The extent and schedule of inspections and testing in accordance with EPRI TR-107396, assure detection of corrosion before the loss of intended function of the component. Performance and functional testing in accordance with EPRI TR-107396, ensures acceptable functioning of the closed cycle cooling water (CCCW) system or components serviced by the CCCW system. For systems and components in continuous operation, performance adequacy is determined by monitoring data trends for evaluation of heat transfer fouling, pump wear characteristics, and branch flow changes. Components not in operation are periodically tested to ensure operability.”

BFN Evaluation

With the implementation of this enhancement, the Closed-Cycle Cooling Water System Program will be consistent with the affected program element for all three units.

Operating Experience

Industry operating experience demonstrates that monitoring and maintenance of corrosion inhibitors in closed cooling water systems is effective in mitigating loss of material, cracking, and reduction of heat transfer.

The BFN closed-cycle cooling water systems have not experienced a loss of intended function of components due to corrosion product buildup or through-wall cracking for components within the scope of license renewal. Inspection and testing of the BFN closed-cycle cooling water systems has detected loss of material and corrosion product buildup. In addition, corrective actions have been initiated in response to engineering evaluations of Closed-Cycle Cooling Water System Program inspection and testing results. Corrective actions were completed in a timely manner prior to loss of system or component intended functions.

Conclusion

The continued implementation of the Closed-Cycle Cooling Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.19 Boraflex Monitoring Program

BFN uses BORAL panels rather than BORAFLEX sheets as its high density fuel rack neutron absorber. See UFSAR, Section **10.3**, Spent Fuel Storage. BFN has determined that a BORAL aging management program in not required.

B.2.1.20 Inspection of Overhead Heavy Load and Light Load Handling Systems Program

Program Description

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program is a condition monitoring program that is implemented by the 10 CFR 50.65 Maintenance Rule program. Crane inspection activities verify structural integrity of the crane components required to maintain the crane intended function. Visual inspections assess conditions such as loss of material due to corrosion of structural members, misalignment, flaking, sidewear of rails, loose tie down bolts, and excessive wear or deformation of monorails. Crane functional tests are periodically performed to assure the cranes capability. The effectiveness of the program being monitored is in accordance with the guidance of RG 1.160, “Monitoring the Effectiveness of Maintenance at Nuclear Power Plants.”

Inspection requirements are consistent with:

- The guidance provided by NUREG-0612, “Control of Heavy Loads at Nuclear Power Plants” for load handling systems that handle heavy loads which can directly or indirectly cause a release of radioactive materials.
- Applicable industry standards for other cranes within the scope of license renewal.
- Applicable OSHA regulations (such as 29 CFR Volume XVII, Part 1910, and Section 1910.179).

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load Handling Systems Program is an existing program that, with the following exception, is consistent with the NUREG-1801 XI.M23 evaluation.

Exceptions to NUREG-1801

Crane fatigue is not monitored.

Program Elements Affected:

Element 3 - Parameters Monitored or Inspected

“The program evaluates the effectiveness of the maintenance monitoring program and the effects of past and future usage on the structural reliability of cranes. The number and magnitude of lifts made by the crane are also reviewed.”

BFN Evaluation

Reactor Building crane fatigue was evaluated as a TLAA in Section 4.7.1. The disposition of the TLAA is that the analyses are valid through the period of extended operation because the 60-year 7,500-cycle estimate remains a small fraction of the 100,000 cycle design. Therefore aging management of crane fatigue is not required.

Enhancements

None

Operating Experience

No incidents of failure of passive crane components due to aging have occurred at BFN.

Conclusion

The continued implementation of the Inspection of Overhead Heavy Load and Light Load Handling Systems Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.21 Compressed Air Monitoring Program

Program Description

The Compressed Air Monitoring Program consists of:

(a) Condition monitoring - Inspection and testing of the entire system is performed. This includes frequent leak testing of valves, piping, and other system components.

(b) Preventive actions - Air quality at various locations in the system is monitored to ensure that oil, water, rust, dirt, and other contaminants are kept within the specified limits. The AMP provides for timely corrective actions to ensure that the system is operating within specified limits.

The Compressed Air Monitoring Program is based on NRC GL 88-14, "Instrument Air Supply System Problems Affecting Safety-Related Equipment," and the Institute of Nuclear Power Operations Significant Operating Experience Report 88-01, "Instrument Air System Failures." The Compressed Air Monitoring Program also incorporates provisions conforming to the guidance of the EPRI NP-7079, "Instrument Air Systems, A Guide for Power Plant Maintenance Personnel," that was developed to assist utilities in identifying and correcting system problems in the instrument air system and to enable them to maintain required industry safety standards.

NUREG-1801 Consistency

The Compressed Air Monitoring Program is an existing program that, with enhancements, will be consistent with the NUREG-1801 XI.M24 evaluation.

Exceptions to NUREG-1801

None

Enhancements

Enhancements to the Compressed Air Monitoring Program include program and procedure upgrades that will be credited for license renewal to ensure that the applicable aging effects are discovered and evaluated.

<u>Enhancement 1</u>

Update the Compressed Air Monitoring Program requirements based on the following guidelines:

- ASME OM-S/G-2000, Part 17, "Performance Testing of Instrument Air Systems in Light-Water Reactor Power Plants"
- ANSI/ISA-S7.0.01-1996, "Quality Standard for Instrument Air"
- EPRI TR-108147, "Compressor and Instrument Air System Maintenance Guide"

This enhancement is scheduled for completion prior to entering the period of extended operation.

Program Elements Affected:

Element 2 - Preventive Actions

"The system air quality is monitored and maintained in accordance with the plant owner's testing and inspection plans, which are designed to ensure that the system and equipment meet specified operability requirements. These requirements are prepared from consideration of manufacturer's recommendations for individual components and guidelines based on ASME OM-S/G-1998, Part 17; ISA-S7.0.01-1996; EPRI NP-7079; and EPRI TR-108147. The preventive maintenance program addresses various aspects of the inoperability of air-operated components due to corrosion and the presence of oil, water, rust, and other contaminants."

Element 4 - Detection of Aging Effects

"Guidelines in EPRI NP-7079, EPRI TR-108147, and ASME OM-S/G-1998, Part 17, ensure timely detection of degradation of the compressed air system function. Degradation of the piping and any equipment would become evident by observation of excessive corrosion, by the discovery of unacceptable leakage rates, and by failure of the system or any item of equipment to meet specified performance limits."

BFN Evaluation

With the implementation of this enhancement, the BFN Compressed Air Monitoring Program will be consistent with the affected program elements.

Enhancement 2

Unit 1 control air system procedures will be updated to fully implement the Compressed Air Monitoring Program on Unit 1. This enhancement is scheduled for completion prior to Unit 1 restart from its current extended outage.

Program Elements Affected:

Element 3 - Parameters Monitored or Inspected

"Inservice inspection (ISI) and testing is performed to verify proper air quality and confirm that maintenance practices, emergency procedures, and training are adequate to ensure that the intended function of the air system is maintained."

BFN Evaluation

With the implementation of this enhancement, the BFN Compressed Air Monitoring Program will be consistent with the affected program element.

Operating Experience

Through air quality testing and sampling of BFN compressed air systems, various contaminants (such as, moisture, oil, and particulates) have been identified above acceptable levels. Appropriate corrective actions have been taken. Examples of other plant-specific operating experience are:

- Air dryer prefilter found clogged or ruptured due to corrosion product buildup,
- Leak on the control air line from 2-LIC-006-0062B to 2-LCV-006-0062B (a nonsafety-related level control valve in the Heater Vent and Drain System)
- Failure in a carbon steel 1 inch service air elbow in the Unit 1 RB ventilation pit that resulted in a service air leak large enough to fully load the service air compressor
- Corrosion products and water in service air lines.
- Dry well control air suction filter housing was discovered to be approximately 1/2 full of water.

Conclusion

The continued implementation of the Compressed Air Monitoring Program with the identified enhancements provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.22 BWR Reactor Water Cleanup System Program

Program Description

The Reactor Water Cleanup System Program includes:

(a) Inservice inspection and monitoring. NUREG-1801 element 1 criteria related to inspection guidelines for Reactor Water Cleanup system piping welds outboard of the second isolation valve states that no inspections are recommended if the piping is replaced with IGSCC resistant material and if the actions of GL 89-10 are completed (**F.5** and **F.13**).

(b) Control of reactor coolant water chemistry to manage the effects of stress corrosion cracking or intergranular stress corrosion cracking on the intended function of austenitic stainless steel piping in the reactor water cleanup system.

The BFN Chemistry Control Program (B.2.1.5) controls water chemistry within parameters that prevent, minimize, and mitigate intergranular stress corrosion cracking.

NUREG-1801 Consistency

The Reactor Water Cleanup System Program is an existing program that requires enhancement to be consistent with NUREG-1801 XI.M25 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

The following measures will be implemented on Unit 1:

- The recommendations of GL 88-01 and NUREG-0313 will be implemented.
- The actions requested in NRC GL 89-10 will be satisfactorily completed.

The enhancements are scheduled for completion prior to the period of extended operation.

Program Elements Affected

Element 1- Scope of Program

“Based on the NRC letter (September 15, 1995) on the screening criteria related to inspection guidelines for RWCU piping welds outboard of the second isolation valve, the program includes the measures delineated in NUREG-0313, Rev. 2, and NRC GL 88-01 to monitor SCC or IGSCC and its effects on the intended function of austenitic SS piping. The screening criteria include:

- Satisfactory completion of all actions requested in NRC GL 89-10
- No detection of IGSCC in RWCU welds inboard of the second isolation valves (ongoing inspection in accordance with the guidance in NRC GL 88-01
- No detection of IGSCC in RWCU welds outboard of the second isolation valves after inspecting a minimum of 10% of the susceptible piping

No IGSCC inspection is recommended for plants that meet all three criteria or that meet criterion (a) and piping is made of material that is resistant to IGSCC.”

BFN Evaluation

With the completion of the GL 88-01 and GL 89-10 actions on all units, no IGSCC inspections are required for any BFN unit.

Element 2 - Preventive Actions

“The comprehensive program outlined in NUREG-0313 and NRC GL 88-01 addresses improvements in all three elements that, in combination, cause SCC or IGSCC. These elements are a susceptible (sensitized) material, a significant tensile stress, and an aggressive environment. The program delineated in NUREG-0313 and NRC GL 88-01 includes recommendations regarding selection of materials that are resistant to sensitization, use of special processes that reduce residual tensile stresses, and monitoring and maintenance of coolant chemistry. The resistant materials are used for new and replacement components and include low-carbon grades of austenitic SS and weld metal, with a maximum carbon of 0.035 wt.% and a minimum ferrite of 7.5% in weld metal and CASS. Inconel 82 is the only commonly used nickel-base weld metal considered to be resistant to SCC; other nickel-alloys, such as Alloy 600, are evaluated on an individual basis. Special processes are used for existing as well as new and replacement components. These processes include solution heat treatment, heat sink welding, induction heating, and mechanical stress improvement. The program delineated in NUREG-0313 and NRC GL 88-01 varies depending on the plant-specific reactor water chemistry to mitigate SCC or IGSCC.”

BFN evaluation

With completion of the enhancements the Reactor Water Cleanup System Program will be consistent with this affected program element for all three units.

Element 3 - Parameters Monitored or Inspected

"The aging management program monitors SCC or IGSCC of austenitic SS piping by detection and sizing of cracks by implementing the inspection guidelines delineated in the NRC screening criteria for the RWCU piping outboard of isolation valves. The following schedules are followed:

Schedule A:	No inspection is required for plants that meet all three criteria set forth above, or if they meet only criterion (a), piping is made of material that is resistant to IGSCC, as described above in preventive actions.
Schedule B:	For plants that meet only criterion (a): Inspect at least 2% of the welds or two welds every refueling outage, whichever sample is larger.
Schedule C:	For plants that do not meet criterion (a): Inspect at least 10% of the welds every refueling outage."

BFN evaluation

With the implementation of the enhancements, the Reactor Water Cleanup System Program will be consistent with this affected program elements.

Operating Experience

IGSCC has occurred in boiling water reactor piping made of austenitic stainless steel. The comprehensive program outlined in NRC GL 88-01 and NUREG-0313 addresses improvements in managing the elements (susceptible material, significant tensile stress, and an aggressive environment) that cause stress corrosion cracking or inter-granular stress corrosion cracking. The comprehensive program has been effective in managing inter-granular stress corrosion cracking in austenitic stainless steel piping in the Reactor Water Cleanup System.

BFN has experienced IGSCC in the past with piping made of austenitic stainless steel. The following measures that have been implemented have proven effective at managing inter-granular stress corrosion cracking in austenitic stainless steel piping in the Reactor Water Cleanup System: 1.) replacement of IGSCC susceptible material with IGSCC resistant material, 2.) establishment of a Hydrogen Water Chemistry program, and 3.) water chemistry controls in accordance with EPRI (BWRVIP) guidelines.

Conclusion

The continued implementation of the Reactor Water Cleanup System Program with the identified enhancements provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.23 Fire Protection Program

Program Description

The Fire Protection Program includes fire barrier inspections and diesel-driven fire pump tests. Fire Protection inspections and tests are mandated by the Fire Protection Report Volume 1, which is incorporated by reference into UFSAR **10.11**.

The Fire Protection Report requires periodic visual inspection of fire barrier penetration seals, fire barrier walls, ceilings, and floors, and periodic visual inspection of fire rated doors to ensure that their operability is maintained. The Fire Protection Report requires that the diesel-driven fire pump be periodically tested to ensure that the fuel supply line can perform the intended function. The Fire Protection Report also includes periodic inspection and test of the carbon dioxide fire suppression system (**F.3**).

NUREG-1801 Consistency

The Fire Protection Program is an existing program that takes exceptions to NUREG-1801 XI.M26 evaluation elements and requires enhancement to be consistent with other NUREG-1801 XI.M26 evaluation elements.

Exceptions to NUREG-1801

Exception 1

Personnel performing fire seal and fire door inspections are not qualified to VT-1 and VT-3 requirements.

Program Elements Affected:

Element 4 - Detection of aging effects

“Visual inspection of penetration seals detects cracking, seal separation from walls and components, and rupture and puncture of seals. Visual inspection (VT-1 or equivalent) of approximately 10% of each type of seal in walkdowns is performed at least once every refueling outage. If any sign of degradation is detected within that sample, the scope of the inspection is expanded to include additional seals. Visual inspection (VT-1 or equivalent) of the fire barrier walls, ceilings, and floors performed in walkdown at least once every refueling outage ensures timely detection for concrete cracking, spalling, and loss of material. Visual inspection (VT-3 or equivalent) detects any sign of degradation of the fire door such as wear and missing parts. Periodic visual inspection detects degradation of the fire doors before there is a loss of intended function.”

BFN Evaluation

Personnel performing fire seal and fire door inspections are trained and experienced in fire protection program requirements. The quality of the fire barrier penetration seal and fire door inspections are equivalent to VT-1 and VT-3 inspections as evidenced by the history of identifying conditions requiring maintenance, repair, or replacement at BFN.

<u>Exception 2</u>

The BFN Fire Protection Report requires testing and inspection of the carbon dioxide system once per 18 months.

<u>Program Elements Affected</u>

Element 3 - Parameters Monitored or Inspected

"Periodic visual inspection and function test at least once every six months examines the signs of degradation of the halon/carbon dioxide fire suppression system. Material conditions that may affect the performance of the system, such as corrosion mechanical damage, or damage to dampers, are observed during these tests."

Element 4 - Detection of aging effects

"Visual inspections of the halon/carbon dioxide fire suppression system detect any sign of degradation, such as corrosion, mechanical damage, or damage to dampers. The periodic function test and inspection performed at least once every six months detects degradation of the halon/carbon dioxide fire suppression system before the loss of the component intended function."

BFN Evaluation

The 18-month frequency is considered sufficient to ensure system availability and operability based on the plant operating history that there has been no aging related event that has adversely affected system operation.

The 18-month frequency is included in the BFN current licensing basis (CLB). Fire Protection Report Vol.1 Fire Protection Systems Surveillance Requirement 9.4.11.D, CO_2 Systems, mandates the CO_2 systems' requirements for demonstrating operability as follows:

"1. Each of the required CO_2 systems shall be demonstrated OPERABLE.

  b. At least once per 18 months by verifying:

    1. The system, including associated ventilation system fire dampers and fire door release mechanisms, actuates manually and automatically upon receipt of a simulated actuation signal, and

    2. Flow from each nozzle during a "Puff Test"."

Enhancements

The Fire Protection Report and procedures will be updated to include Unit 1 as an operating rather than a shutdown unit. The Fire Protection Program will be fully implemented on Unit 1. The enhancement is scheduled for completion prior to the period of extended operation.

> <u>Program Element Affected</u>:
>
> Element 5 - Monitoring and Trending
>
> “The aging effects of weathering on fire barrier penetration seals are detectable by visual inspection and, based on operating experience, visual inspections performed at least once every refueling outage detect any sign of degradation of fire barrier penetration seals prior to loss of the intended function.
>
> Concrete cracking, spalling, and loss of material are detectable by visual inspection and, based on operating experience, visual inspection performed at least once every refueling outage detects any sign of degradation of the fire barrier walls, ceilings, and floors before there is a loss of the intended function. Based on operating experience, degraded integrity or clearances in the fire door are detectable by visual inspection performed on a plant specific frequency. The visual inspections detect degradation of the fire doors prior to loss of the intended function. “
>
> BFN Evaluation
>
> With the implementation of this enhancement, BFN will be consistent with the affected program element for all three units.

Operating Experience

BFN has evaluated applicable information notices (IN 88-56, IN 94-28, IN 97-70, IN 91-47) and GL 92-08. Applicable guidelines and requirements have been incorporated into the Fire Protection Report and implementing procedures.

The BFN Fire Protection Program has been effective in identifying aging effects and has taken appropriate corrective action prior to loss of intended function. Minor degradation of penetration seals, electrical raceway fire barriers and fire doors has been identified and corrective actions taken. Operating experience at BFN has shown no corrosion-related problems identified for the fuel oil supply line and pump casings of the diesel-driven fire pumps. No significant aging related problems have been reported for BFN fire protection systems and components managed by the Fire Protection AMP.

Conclusion

The continued implementation of the Fire Protection Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.24 Fire Water System Program

Program Description

The Fire Water System Program applies to water-based fire protection systems that consist of sprinklers, nozzles, fittings, valves, hydrants, hose stations, standpipes, water storage tanks, and aboveground and underground piping and components that are tested in accordance with the applicable National Fire Protection Association codes and standards. The testing assures the minimum functionality of the systems.

The fire water system tests are mandated by the Fire Protection Report Volume 1 which is incorporated by reference into UFSAR **10.11** (**F.3**).

NUREG-1801 Consistency

The Fire Water System Program is an existing program that takes exceptions to NUREG-1801 XI.M27 evaluation elements, as modified by ISG-04, and requires enhancements to be consistent with other NUREG-1801 XI.M27 evaluation elements.

Exceptions to NUREG-1801

BFN has not confirmed that water-based fire protection systems meet the inspection, testing and maintenance requirements of current NFPA standards. However, the BFN Fire Water Program was developed using NFPA as well as other applicable industry guides and standards and the design of the water based system generally meets the applicable NFPA standards.

Program Element Affected:

Element 3 – Parameters Monitored or Inspected (As modified by ISG-04)

“Loss of material due to corrosion and biofouling could reduce wall thickness of the fire protection piping system and result in system failure. Therefore, the parameters monitored are the system's ability to maintain pressure and internal system corrosion conditions. Perform periodic flow testing of the fire water system using the guidelines of NFPA 25, Chapter 13, Annexes A & D at the maximum design flow or perform wall thickness evaluations to ensure that the system maintains its intended function.”

Element 5 – Monitoring and Trending (As modified by ISG-04)

“System discharge pressure is monitored continuously. Results of system performance testing are monitored and trended as specified by the NFPA codes and standards. Degradation identified by non-intrusive or internal inspection is evaluated.”

BFN Evaluation for Elements 3 and 5

BFN has not confirmed that periodic flow testing is performed using the guidelines of NFPA 25 as described in Element 3; nor has it confirmed that the results of system performance testing are monitored and trended as specified by the current NFPA codes and standards as described in Element 5. However, the BFN Fire Water Program was developed using NFPA as well as other applicable industry guides and standards.

The Fire Water Program includes flow test, system inspection, and system monitoring evaluations to ensure that the system maintains its intended function. The program monitors the systems' ability to maintain pressure and detection of internal system corrosion conditions. System and component testing and inspections, as well as periodic flow testing, are required by the program. In addition, the option to perform volumetric examinations will be included as an enhancement to the program.

Element 10 – Operating Experience (As modified by ISG-04)

"Water-based fire protection systems designed, inspected, tested and maintained in accordance with the NFPA minimum standards have demonstrated reliable performance."

BFN Evaluation for Element 10

BFN has not confirmed that water-based fire protection systems are inspected, tested and maintained in accordance with the current NFPA standards.

The fire water system parameters are monitored and tested, and piping and component evaluations are performed to ensure that the system maintains its intended function. BFN fire water system operating experience indicates a trend of piping degradation, such as leaks, general corrosion, biofouling, etc. Piping is being replaced, as required, per corrective actions of the inspection and testing activities.

Enhancements

Enhancement 1

The Fire Protection Report and procedures will be updated to include Unit 1 as an operating rather than a shutdown unit. The Fire Water System Program will be fully implemented on Unit 1. This enhancement is scheduled for completion prior to the period of extended operation.

Program Element Affected:

Element 1 - Scope of Program (As modified by ISG-04)

"The aging management program focuses on managing loss of material due to corrosion, MIC, or biofouling of carbon steel and cast-iron components in fire protection systems exposed to water. Hose stations and standpipes are considered as piping in the AMP."

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element for all three units.

Enhancement 2

BFN will perform flow tests or non-intrusive examinations (e.g., volumetric tests for wall thickness of fire protection system piping) to identify evidence of loss of material due to corrosion. These inspections will be performed before entering the period of extended operation.

Program Elements Affected:

Element 3 - Parameters Monitored or Inspected (As modified by ISG-04)

"Loss of material due to corrosion and biofouling could reduce wall thickness of the fire protection piping system and result in system failure. Therefore, the parameters monitored are the system's ability to maintain pressure and internal system corrosion conditions. Perform periodic flow testing of the fire water system using the guidelines of NFPA 25, Chapter 13, Annexes A & D at the maximum design flow or perform wall thickness evaluations to ensure that the system maintains its intended function."

BFN Evaluation

The BFN Fire Water System Program monitors parameters that are indicative of the systems' ability to maintain pressure and allow detection of internal system corrosion conditions. The Fire Water System Program requires system and component testing and inspections as well as periodic flow testing. Wall thickness evaluations are determined by the system engineer when systems are opened for maintenance and by pressure tests/leak detection. The BFN Fire Water System Program includes flow testing, and system evaluations to ensure that the system maintains its intended function.

Element 4 - Detection of Aging Effects (As modified by ISG-04)

"Fire protection system testing is performed to assure that the system functions by maintaining required operating pressures. Wall thickness evaluations of fire protection piping are performed on system components using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material due to corrosion. These inspections are performed before the end of the current operating term and at plant specific intervals thereafter during the period of extended operation. As an alternative to non-intrusive testing, the plant maintenance process may include a visual inspection of the internal surface of the fire protection piping upon each entry to the system for routine or corrective maintenance, as long as it can be demonstrated that inspections are performed (based on past maintenance history) on a representative number of locations on a reasonable basis. These inspections must be capable of evaluating (1) wall thickness to ensure against catastrophic failure and (2) the inner diameter of the piping as it applies to the flow requirements of the fire protection system. If the environmental and material conditions that exist on the interior surface of the below grade fire protection piping are similar to the conditions that exist within the above grade fire protection piping, the results of the inspections of the above grade fire protection piping can be extrapolated to evaluate the condition of below grade fire protection piping. If not, additional inspection activities are needed to ensure that the intended function of below grade fire protection piping will be maintained consistent with the current licensing basis for the period of extended operation. Repair and replacement actions are initiated as necessary. Continuous system pressure monitoring, system flow testing, and wall thickness evaluations of piping are effective means to ensure that corrosion and biofouling are not occurring and the system's intended function is maintained."

BFN Evaluation

The environmental and material conditions that exist on the interior surface of the below grade fire water system piping are similar to the conditions that exist within the above grade fire water system piping. The results of the inspections of the above grade fire water system piping will be extrapolated to evaluate the condition of below grade fire water system piping to ensure that the intended function of below grade fire water system piping will be maintained consistent with the current licensing basis for the period of extended operation. Repair and replacement actions are initiated as necessary.

The plant specific inspection intervals are to be determined by engineering evaluation of the fire protection piping to detect degradation prior to the loss of intended function. The purpose is to ensure that corrosion, microbiologically influenced corrosion, or biofouling is managed such that the system function is maintained.

With the implementation of this enhancement, BFN will be consistent with the affected program elements, except for the exception previously described for Element 3.

Enhancement 3

BFN will perform sprinkler head inspections before the end of the 50-year sprinkler head service life and at 10-year intervals thereafter during the period of extended operation to ensure that signs of degradation, such as corrosion, are detected in a timely manner. This enhancement is scheduled for completion prior to exceeding the 50-year service life for any sprinkler.

Program Element Affected:

Element 4 - Detection of Aging Effects

" ... Sprinkler heads are inspected before the end of the 50-year sprinkler head service life and at 10 year intervals thereafter during the extended period of operation to ensure that signs of degradation, such as corrosion, are detected in a timely manner."

BFN Evaluation

A sample of sprinkler heads will be inspected using the guidance of NFPA 25, 2002 edition, section 5.3.1.1.1. This NFPA section states that "where sprinklers have been in place for 50 years, they shall be replaced or representative samples from one or more sample areas shall be submitted to a recognized testing laboratory for field service testing." It also contains guidance to perform this sampling every 10 years after the initial field service testing.

With the implementation of this enhancement, BFN will be consistent with the affected program element.

Operating Experience

The fire water system parameters are monitored, tested and piping and component evaluations are performed to ensure that the system maintains its intended function. Browns Ferry Fire Water System operating experience indicates a trend of piping degradation, such as leaks, general corrosion, biofouling, etc. Piping is being replaced, as required, per corrective actions of the inspection and testing activities.

Conclusion

The continued implementation of the Fire Water System Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.25 Buried Piping and Tanks Surveillance Program

NUREG-1801 Volume 1 Table 3, “Summary of Aging Management Programs for the Auxiliary Systems Evaluated in Chapter VII of the GALL Report,” and Table 4, “Summary of Aging Management Programs for the Steam and Power Conversion System Evaluated in Chapter VIII of the GALL Report,” allow either of the following programs to be used to manage the aging effects of buried piping and tanks:

(a) Buried Piping and Tanks Surveillance program evaluated in NUREG-1801 Volume 2 Section XI.M28.

(b) Buried Piping and Tanks Inspection program evaluated in NUREG-1801 Volume 2 Section XI.M34.

BFN has elected to implement the Buried Piping and Tanks Inspection Program described in Section **B.2.1.31** to manage the aging effects of buried piping and tanks. There are no buried tanks that are in-scope for license renewal.

B.2.1.26 Aboveground Carbon Steel Tanks Program

Program Description

The only aboveground carbon steel tanks that require aging management during the period of extended operation are the unit-assigned condensate storage tanks. The Aboveground Carbon Steel Tanks Program includes:

(a) Preventive measures to mitigate corrosion - The external surface of carbon steel tanks are protected with paint or coatings in accordance with standard industry practice. The flat-bottomed Condensate Storage Tanks sit on beds of compacted sulfur-free oiled sand.

(b) Condition monitoring for degradation - Periodic inspections are performed in accordance with the 10 CFR 50.65 Maintenance Rule Program. The tanks are inspected for signs of leakage; presence of significant rust; loose, missing, or damaged anchors/fasteners; cracked welds which may be a structural concern; deformation in the tank body; corroded anchorage or; general signs of settlement or other degradation. Quarterly inspections are also performed in accordance with the Systems Monitoring Program (**B.2.1.39**).

(c) Activities to ensure that significant degradation in inaccessible tank bottoms is not occurring - A one time inspection in accordance with the One-Time Inspection program (**B.2.1.29**) will be performed prior to entering the period of extended operation and will consist of thickness measurements of flat-bottomed tanks' bottom surface.

NUREG-1801 Consistency

The Aboveground Carbon Steel Tanks Program is an existing program that is consistent with NUREG-1801 XI.M29 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Some external corrosion problems have been reported on carbon steel tanks at BFN. Corrective actions have been implemented prior to loss of intended function.

Conclusion

The continued implementation of the Aboveground Carbon Steel Tanks Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.27 Fuel Oil Chemistry Program

Program Description

The Fuel Oil Chemistry Program includes:

(a) Surveillance and maintenance procedures to mitigate corrosion - Fuel oil quality is maintained by monitoring and controlling fuel oil contamination in accordance with the guidelines of the American Society for Testing Materials (ASTM) Standards D 1796, D 2276, and D 4057. Exposure to fuel oil contaminants, such as water and microbiological organisms, is minimized by periodic draining or cleaning of tanks and by verifying the quality of new oil before its introduction into the storage tanks. Procedures require performance of fuel oil tank bottom and multi-level sampling on a quarterly basis to detect and remove water and sediment from each tank. In addition, each 7-day diesel oil supply tank is cleaned and inspected at intervals of approximately 10 years.

(b) Measures to verify the effectiveness of the AMP and confirm the absence of an aging effect - A one-time inspection in accordance with the One-Time Inspection Program (**B.2.1.29**) will be performed prior to entering the period of extended operation and will consist of thickness measurements of the 7-day diesel oil supply tanks' bottom surface.

Portions of the Fuel Oil Chemistry Program are mandated by Technical Specification 5.5.9, "Diesel Fuel Oil Testing Program," that requires:

> "A diesel fuel oil testing program to implement required testing of the fuel oil in each 7-day fuel oil tank shall be established. The purpose of the program is to establish the following:
>
> - The quality of the fuel oil in each 7-day fuel oil tank is within the acceptable limits specified in Table 1 of ASTM D-975-1989 when tested every 92 days; and
> - Total particulate concentration of the fuel oil in each 7-day fuel oil tank is $\leq$ 10 mg/l when tested every 92 days in accordance with ASTM D-2276, Method A-2 or A-3."

NUREG-1801 Consistency

The Fuel Oil Chemistry Program is an existing program that takes an exception to NUREG-1801 XI.M30 evaluation elements.

Exception to NUREG-1801

This exception to NUREG-1801 is that BFN does not use ASTM Standard D 2709 for guidance on the determination of water and sediment contamination in diesel fuel as referenced in the NUREG 1801. BFN does implement ASTM Standard D 1796 guidance on the determination of water and sediment contamination.

<u>Program Elements Affected:</u>

Element 1 - Scope of Program

"The program is focused on managing the conditions that cause general, pitting, and microbiologically influenced corrosion (MIC) of the diesel fuel tank internal surfaces. The program serves to reduce the potential of exposure of the tank internal surface to fuel oil contaminated with water and microbiological organisms."

Element 3 - Parameters Monitored or Inspected

"The AMP monitors fuel oil quality and the levels of water and microbiological organisms in the fuel oil, which cause the loss of material of the tank internal surfaces. The ASTM Standard D 4057 is used for guidance on oil sampling. The ASTM Standards D 1796 and D 2709 are used for determination of water and sediment contamination in diesel fuel. For determination of particulates, modified ASTM D 2276, Method A, is used. The modification consists of using a filter with a pore size of 3.0 microns, instead of 0.8 microns. These are the principal parameters relevant to tank structural integrity."

Element 6 - Acceptance Criteria

"The ASTM Standard D 4057 is used for guidance on oil sampling. The ASTM Standards D 1796 and D 2709 are used for guidance on the determination of water and sediment contamination in diesel fuel. Modified ASTM D 2276, Method A is used for determination of particulates. The modification consists of using a filter with a pore size of 3.0 microns, instead of 0.8 microns."

BFN Evaluation

The ASTM D 1796 test method is an acceptable laboratory test method per ASTM D 975-89, "Standard Specification for Diesel Fuel Oils," for the determination of water and sediment contamination in the Grade 2 fuel oil used at BFN.

Enhancements

None

Operating Experience

The Fuel Oil Chemistry Program includes identification of water and particulate contamination in the diesel fuel oil system. Corrective actions were taken for the water and particulate contamination removal and system/component inspections. However, there have been no instances of fuel oil system component failures at BFN attributed to contamination.

Conclusion

The continued implementation of the Fuel Oil Chemistry Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.28 Reactor Vessel Surveillance Program

Program Description

The Reactor Vessel Surveillance Program is mandated by 10 CFR 50 Appendix H. The Reactor Vessel Surveillance Program is an integrated surveillance program in accordance with 10 CFR Part 50 Appendix H Paragraph III.C that is based on requirements established by the BWR Vessel and Internals Project. Referencing of BWR Vessel and Internals Project activities for license renewal was approved by the NRC in its Safety Evaluation[10] regarding BWRVIP-74[11] of October 18, 2001. The demonstration of compliance with the required actions of the Safety Evaluation is summarized in Section **3.1.2.2.16**.

The BFN Reactor Vessel Surveillance Program is described in UFSAR Section **4.2.6** and is based on BWRVIP-78[12] and BWRVIP-86.[13] Use of the BWRVIP-78 and BWRVIP-86 was approved for referencing in the NRC's Safety Evaluation[14] of February 1, 2000. Use of the BWRVIP integrated surveillance program at BFN was approved by the NRC in its Safety Evaluation[15] of January 28, 2003

For license renewal, the extent of reactor vessel embrittlement for upper-shelf energy has been projected in accordance with the NRC RG 1.99, Rev. 2, "Radiation Embrittlement of Reactor Vessel Materials." This projection, along with a description of methodology and assumptions, is presented in Section **4.2**.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program is an existing program that, with the following enhancements, will be consistent with NUREG-1801 XI.M31 evaluation.

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10 NRC letter (Accession No. ML012920549) to BWRVIP, "Acceptance Criteria for Referencing of EPRI Proprietary Report TR-113596, 'BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Inspection and Flaw Evaluation Guidelines (BWRVIP-74)' and Appendix A, 'Demonstration of Compliance with the Technical Information Requirements of the License Renewal Rule (10 CFR 54.21)'," dated October 18, 2001

11 EPRI Report TR-113596, BWR Vessel and Internals Project, BWR Reactor Pressure Vessel Shell Inspection and Flaw Evaluation Guidelines (BWRVIP-74), September, 1999

12 EPRI Report TR-114228, BWR Integrated Surveillance Program Plan (BWRVIP-78), December 1999.

13 EPRI Report TR-1000888, BWRVIP-86: BWR Vessel and Internals Project, BWR Integrated Surveillance Program Implementation Plan Final Report, December 2000

14 NRC letter (Accession No. ML020380691) to BWRVIP, "Safety Evaluation Regarding EPRI Proprietary Reports BWR Vessel And Internals Project, BWR Integrated Surveillance Program Plan (BWRVIP-78), and BWRVIP-86: BWR Vessel And Internals Project, BWR Integrated Surveillance Program Implementation Plan," dated Feb 1, 2002

15 NRC letter (Accession No. ML010920411) to BWRVIP, "Browns Ferry Nuclear Plant, Units 2 and 3 - Issuance of Amendments re: Implementation of the Boiling -Water Reactor Vessel and Internals project Reactor Pressure Vessel Integrated Surveillance program to Address the Requirements of Appendix H to 10 CFR Part 50 (TAC Nos. MB6677 and MB6678," dated January 28, 2003

Exceptions to NUREG-1801

None

Enhancements

Enhancement 1

BFN will confirm that the BWRVIP integrated surveillance program for the period of extended operation, if approved by the NRC for the BWR fleet, is applicable to each reactor vessel and will request the approval from the NRC, if necessary, to use the program at applicable reactor vessels for the period of extended operation.

This enhancement is scheduled for completion prior to the period of extended operation.

Program Elements Affected:

Element 1 - Scope of Program

“Reactor vessel surveillance programs are plant specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant submits its proposed withdrawal schedule for approval prior to implementation. Thus, further staff evaluation is required for license renewal.”

BFN Evaluation

The BWRVIP integrated surveillance program described in BWRVIP-78 and BWRVIP-86 is only applicable for current license term of 40 years. However, the BWRVIP-78 and BWRVIP-86 integrated surveillance program provides for 13 capsules to be available for testing during the license renewal period for the BWR fleet and establishes acceptable technical criteria for capsule withdrawal and testing. The BWRVIP has committed to provide supplemental information to the NRC to extend the BWRVIP integrated surveillance program through the period of extended operation, based on the same technical criteria as found in BWRVIP-78 and BWRVIP-86. This information has recently been prepared and incorporated into BWRVIP-116[16]. The NRC review of BWRVIP-116 is not complete. When NRC review of BWRVIP-116 is complete, BFN will evaluate the NRC SER and complete SER Action Items.

BFN expects to implement the requirements of BWRVIP-116, when approved, for all three reactor vessels. Therefore, a plant-specific program is not included in this License Renewal Application.

16 EPRI Technical Report TR-1007824, “BWRVIP-116: BWR Vessel and Internals Project, Integrated surveillance Program (ISP) for License Renewal,” July 2003, transmitted to NRC by BWRVIP letter (Accession No. ML032130239) July 29, 2003

Enhancement 2

Unit 1 will be included within the BWRVIP Integrated Surveillance Program, or a plant specific surveillance program will be submitted for NRC approval that meets the requirements of 10 CFR 50 Appendix H for the period of extended operation. This plant-specific program, if needed, will include the following actions:

- Capsules will be removed periodically to determine the rate of embrittlement and at least one capsule with neutron fluence not less than once or greater than twice the peak beltline neutron fluence will be removed before the expiration of the license renewal period.
- Capsules will contain material to monitor the impact of irradiation on the limiting beltline materials and will contain dosimetry to monitor neutron fluence.
- If capsules are not being removed during the license renewal period, operating restrictions (i.e., inlet temperature, neutron spectrum, and flux) will be implemented with NRC approval to ensure that the reactor vessel is operating within the environment of the surveillance capsules, and will supply ex-vessel dosimetry for monitoring neutron fluence.

This enhancement is scheduled for completion prior to the period of extended operation.

Program Elements Affected:

Element 1 - Scope of Program

"Reactor vessel surveillance programs are plant specific, depending on matters such as the composition of limiting materials, availability of surveillance capsules, and projected fluence levels. In accordance with 10 CFR Part 50, Appendix H, an applicant submits its proposed withdrawal schedule for approval prior to implementation. Thus, further staff evaluation is required for license renewal."

BFN Evaluation

With the implementation of this enhancement, the Reactor Vessel Surveillance Program will be consistent with the affected program element for all three units.

Operating Experience

Browns Ferry has successfully implemented its Reactor Vessel Surveillance Program that is consistent with Regulatory Guide 1.99, Revision 2, 10 CFR 50 Appendix H, and ASTM E 185 predictions.

Conclusion

The continued implementation of the Reactor Vessel Surveillance Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.29 One-Time Inspection Program

Program Description

The One-Time Inspection Program will include measures to verify that unacceptable degradation is not occurring; thereby validating the effectiveness of existing AMPs or confirming that there is no need to manage aging-related degradation for the period of extended operation.

The elements of the One-Time Inspection Program will include:

(a) Determination of the sample size based on an assessment of materials of fabrication, environment, plausible aging effects, and operating experience.

(b) Identification of the inspection locations in the systems, structures or components based on the aging effect.

(c) Determination of the examination technique, including acceptance criteria that would be effective in managing the aging effect for which the component is examined. Non-destructive techniques will generally be used. However in some circumstances (e.g., small bore reactor coolant pressure boundary), destructive testing will be utilized if samples become available.

(d) Evaluation of the need for follow-up examinations to monitor the progression of any aging degradation. When one-time inspections fail to meet the established acceptance criteria, the corrective action program will be used to schedule, track, and trend appropriate corrective actions and follow-up inspections.

The One-Time Inspection Program will include the one-time inspections of systems, structures, and components that are identified in the Aging Management Review, such as:

- Reactor coolant pressure boundary piping, valves, tubing, restricting orifices, and fittings less than four inch NPS exposed to reactor coolant for loss of material and cracking.
- Ventilation ductwork for loss of material and elastomer degradation/deterioration.
- Flexible connections for loss of material, cracking, and elastomer degradation/deterioration.
- Heat exchangers for loss of material, cracking, and biofouling.
- Various fittings, piping, valves, pumps, strainers, tanks, traps, tubing, expansion joints, fan housings, fire dampers, and heaters for loss of material, cracking, and biofouling.

The One-Time Inspection Program will be completed before the end of the current operating license term. The schedule of the inspection will be completed in a way as to minimize the impact on plant operations. However, the inspection will not be scheduled too early in the current operating license term so that there will be no questions raised regarding the continued absence of aging effects prior to and near the extended period of operation.

NUREG-1801 Consistency

The One-Time Inspection Program is a new program that will be consistent with the NUREG-1801 XI.M32 evaluation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection Program is new. Therefore, no programmatic operating experience is available.

Conclusion

The implementation of the One-Time Inspection Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.30 Selective Leaching Of Materials Program

Program Description

The Selective Leaching of Materials Program will consist of visual inspections and hardness measurements on selected components susceptible to selective leaching. The materials of construction for these components may include cast iron, brass, bronze, or aluminum-bronze. These components may be exposed to a raw water, treated water, or ground water environment. The selective leaching program will perform one-time visual inspections and hardness measurements of representative components from those components identified in this LRA's Aging Management Review results.

The Selective Leaching of Materials Program will be completed prior to entering the period of extended operation. The selection, inspection, and measurement techniques will be consistent with industry practice at the time of implementation.

NUREG-1801 Consistency

The Selective Leaching of Materials Program is a new program that will be consistent with the NUREG-1801 XI.M33 evaluation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Selective Leaching of Materials Program is a new program. No operating experience is available.

Conclusion

The implementation of the Selective Leaching of Materials Program will provide reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.31 Buried Piping and Tanks Inspection Program

Program Description

There are no buried tanks that are in-scope for license renewal. The Buried Piping and Tanks Inspection Program includes:

(a) Preventive measures to mitigate corrosion - External coatings and wrappings have been applied in accordance with standard industry practices.

(b) Condition monitoring to manage the effects of corrosion - Buried piping is inspected when excavated for any reason, typically for maintenance. The inspections are performed as part of the 10 CFR 50.65 Maintenance Rule program. The inspections provide for determination of degradation due to the loss of, or damage to, the protective coatings and wraps used for corrosion control on buried pipe external surfaces. The inspections also include connections and joints for signs of separation; signs of environmental degradation; signs of leakage and; appreciable settlement between piping segments.

NUREG-1801 Consistency

The Buried Piping and Tanks Inspection Program is an existing program that is consistent with the NUREG-1801 XI.M34 evaluation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Review of BFN operating experience has identified no concerns relating to the corrosion of external surfaces of buried piping or components. Several instances of buried piping replacement were identified resulting from internal corrosion or microbiological fouling or degradation. There are no buried tanks that are in-scope for license renewal.

Conclusion

The continued implementation of the Buried Piping and Tanks Inspection Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.32 ASME Section XI Subsection IWE Program

Program Description

10 CFR 50.55a imposes the inservice inspection requirements of the ASME B&PV Code Section XI for the BFN steel containments (Class MC). The ASME Section XI Subsection IWE Inservice Inspection program includes visual examination and augmented inspection (visual and/or volumetric examinations) for steel containments (class MC). Inspections or testing are conducted on the steel containment shells and their integral attachments; containment hatches and airlocks; seals, gaskets, and moisture barriers; and pressure-retaining bolting.

As required by 10 CFR 50.55a paragraph (g)(4)(ii), the ASME B&PV Code Section XI Subsection IWE Inservice Inspection program will incorporate the requirements of the latest edition and addenda of the ASME B&PV Code incorporated by reference into 10 CFR 50.55a paragraph (b) 12 months prior to the start of each 120-month inspection interval, subject to the limitations and modifications listed in 10 CFR 50.55a paragraph (b) and with alternatives as authorized by the NRC in accordance with 10 CFR 50.55a paragraphs (a)(3) and (g)(6).

Inspection of class MC components, covered in the Subsection IWE, is performed in accordance with the 1992 edition through 1992 addenda for Units 1, 2, and 3 current inspection intervals.

NUREG-1801 Consistency

The ASME B&PV Code Section XI Subsection IWE Inservice Inspection program is an existing program that takes exceptions to NUREG-1801 XI.S1 evaluation elements.

Exceptions to NUREG-1801

Exception 1

The ASME B&PV Code Section XI 1992 Edition 1992 Addenda Category E-D Item Numbers E5.10 (Seals) and E5.20 (Gaskets) requires a visual examination, VT-3, of containment seals and gaskets. In lieu of a visual examination, BFN utilizes tests performed in accordance with 10 CFR 50 Appendix J (**B.2.1.34**) to determine degradation of seals and gaskets.

> Program Elements Affected:
>
> Element 3 - Parameters Monitored or Inspected
>
> “Table IWE-2500-1 specifies seven categories for examination. The categories, parts examined, and examination methods are presented in the following table. The first six examination categories (E-A through E-G) constitute the ISI requirements of IWE. Examination category E-P references 10 CFR Part 50, Appendix J leak rate testing. Appendix J leak rate testing is evaluated as a separate AMP for license renewal in XI.S4.”

Element 5 - Monitoring and trending

"With the exception of inaccessible areas, all surfaces are monitored by virtue of the examination requirements on a scheduled basis. When component examination results require evaluation of flaws, evaluation of areas of degradation, or repairs, and the component is found to be acceptable for continued service, the areas containing such flaws, degradation, or repairs shall be reexamined during the next inspection period, in accordance with Examination Category E-C. When these reexaminations reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive inspection periods, these areas no longer require augmented examination in accordance with Examination Category E-C."

Element 6 - Acceptance Criteria

"IWE-3000 provides acceptance standards for components of steel containments and liners of concrete containments. Table IWE-3410-1 presents criteria to evaluate the acceptability of the containment components for service following the preservice examination and each inservice examination. This table specifies the acceptance standard for each examination category. Most of the acceptance standards rely on visual examinations. Areas that are suspect require an engineering evaluation or require correction by repair or replacement. For some examinations, such as augmented examinations, numerical values are specified for the acceptance standards. For the containment steel shell or liner, material loss exceeding 10% of the nominal containment wall thickness, or material loss that is projected to exceed 10% of the nominal containment wall thickness before the next examination, are documented. Such areas are to be accepted by engineering evaluation or corrected by repair or replacement in accordance with IWE-3122."

Element 8 - Confirmation Process

"When areas of degradation are identified, an evaluation is performed to determine whether repair or replacement is necessary. If the evaluation determines that repair or replacement is necessary, Subsection IWE specifies confirmation that appropriate corrective actions have been completed and are effective. Subsection IWE states that repairs and reexaminations are to comply with the requirements of IWA-4000. Reexaminations are conducted in accordance with the requirements of IWA-2200, and the recorded results are to demonstrate that the repair meets the acceptance standards set forth in Table IWE-3410-1. As discussed in the appendix to this report, the staff finds the requirements of 10 CFR Part 50, Appendix B, acceptable to address the confirmation process."

BFN Evaluation

Examination of most seals and gaskets require the joints to be disassembled. When the airlocks, hatches, electrical penetrations, and flanged connections are tested in accordance with 10 CFR 50 Appendix J, degradation of the seal or gasket material is revealed by an increase in the leakage rate. Corrective measures can then be applied and the component re-tested. For Units 2 and 3, Relief Request CISI-1[17] was granted for the current inspection intervals allowing 10 CFR 50 Appendix J testing in lieu of a visual examination, VT-3, on the containment seals and gaskets.

Exception 2

The ASME B&PV Code Section XI 1992 Edition 1992 Addenda Table IWE-2500-1, Examination Category E-G, Item Number E8.20 requires torque or tension testing on pressure retaining bolted connections that have not been disassembled and reassembled during the inspection interval. However for Units 2 and 3 during their current inspection intervals, 10 CFR 50 Appendix J testing (**B.2.1.34**) is performed in lieu of a bolt torque or tension test for bolted connections.

Program Element Affected:

Element 3 - Parameters Monitored or Inspected

“Table IWE-2500-1 specifies seven categories for examination. The categories, parts examined, and examination methods are presented in the following table. The first six examination categories (E-A through E-G) constitute the ISI requirements of IWE. Examination category E-P references 10 CFR Part 50, Appendix J leak rate testing. Appendix J leak rate testing is evaluated as a separate AMP for license renewal in XI.S4.”

BFN Evaluation

When the primary containment is tested in accordance with 10 CFR 50 Appendix J, degradation of bolted connections is revealed by an increase in the leakage rate. Corrective measures can then be applied and the component re-tested. For Units 2 and 3, Relief Request CISI-4[18] was granted allowing 10 CFR 50 Appendix J testing in lieu of a bolt torque or tension test for bolted connections.

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17 NRC letter (Accession No. ML01290394) to TVA, “Browns Ferry Nuclear Plant, Units 2 And 3 - Evaluation of Relief Request Nos. CISI-1 through CISI-5: Implementation of Subsections IWE and IWL of ASME SECTION XI for Containment Inspection for Tennessee Valley Authority (TAC NOS. MB1634 AND MB1635),” August 6, 2001

18 NRC letter (Accession No. ML01290394) to TVA, “Browns Ferry Nuclear Plant, Units 2 And 3 - Evaluation of Relief Request Nos. CISI-1 through CISI-5: Implementation of Subsections IWE and IWL of ASME SECTION XI for Containment Inspection for Tennessee Valley Authority (TAC NOS. MB1634 AND MB1635),” August 6, 2001

Exception 3

The ASME B&PV Code Section XI 1992 Edition 1992 Addenda Paragraphs IWE-2420(b) and IWE-2420(c) require that, when component examination results require evaluation of flaws, evaluation of areas of degradation, or repairs in accordance with Article IWE-3000, and the component is found to be acceptable for continued service, the areas containing such flaws, degradation, or repairs shall be reexamined during the next inspection period listed in the schedule of the inspection program of Paragraph IWE-2411 or Paragraph IWE-2412 in accordance with Table IWE-2500-1 Examination Category E-C. When the reexaminations reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive inspection periods, the areas containing such flaws, degradation, or repairs no longer require augmented examination in accordance with Table IWE-2500-1 Examination Category E-C. At BFN if the repair has restored the component to an acceptable condition, reexaminations during subsequent inspection periods are not performed.

Program Element Affected:

Element 5 - Monitoring and trending

"With the exception of inaccessible areas, all surfaces are monitored by virtue of the examination requirements on a scheduled basis. When component examination results require evaluation of flaws, evaluation of areas of degradation, or repairs, and the component is found to be acceptable for continued service, the areas containing such flaws, degradation, or repairs shall be reexamined during the next inspection period, in accordance with Examination Category E-C. When these reexaminations reveal that the flaws, areas of degradation, or repairs remain essentially unchanged for three consecutive inspection periods, these areas no longer require augmented examination in accordance with Examination Category E-C."

BFN Evaluation

The purpose of a repair is to restore the component to an acceptable condition for continued service in accordance with the acceptance standards of Article IWE-3000. If the repair has restored the component to an acceptable condition, successive examinations are not warranted. Relief Request CISI-3[19] was granted for Units 2 and 3 for their current inspection intervals providing relief from the requirement of Paragraphs IWE-2420(b) and IWE-2420(c) to perform reexaminations during subsequent inspection periods of the repaired areas if the repair has restored the component to an acceptable condition.

19 NRC letter (Accession No. ML01290394) to TVA, "Browns Ferry Nuclear Plant, Units 2 And 3 - Evaluation of Relief Request Nos. CISI-1 through CISI-5: Implementation of Subsections IWE and IWL of ASME SECTION XI for Containment Inspection for Tennessee Valley Authority (TAC NOS. MB1634 AND MB1635)," August 6, 2001

Enhancements

None

Operating Experience

BFN reviewed plant specific ASME Section XI, Inservice Inspection Program performance results and it has been shown to be generally effective in managing aging effects in ASME components. Some specific examples of operating experience of component degradation are included in NUREG-1801. Below is a highlight of the operating experience documented from NUREG-1801:

The drywell steel containment vessel is inaccessible (except for the drywell head) for visual examination from the outside surface. There has been evidence of water leaking from the sand bed drains on both Units 2 and 3. Since there is a horizontal weld connecting the first and second course of drywell liner plates approximately 8 inches above the drywell concrete floor, UT thickness measurements from the drywell floor up to this weld, around the drywell circumference, would conservatively bound the sand pocket area. UT thickness measurements of this area were obtained during the U2C10 and U3C8 refueling outages for Units 2 and 3 respectively, and in 1999 and 2002 for Unit 1. The data indicated that the condition of the drywell steel liner plate in this area is good and that this area did not require augmented examination.

The internal drywell steel containment vessel embedment zone is subject to corrosion if the drywell floor-to-containment vessel moisture barrier fails allowing moisture intrusion or if the concrete floor of the drywell cracks allowing moisture seepage through to the steel liner. During the Unit 2 U2C9 outage, a portion of the moisture barrier was replaced. Inspection of the exposed drywell steel containment vessel area below the moisture seal indicated some minor pitting and localized rust, but there was not a challenge to nominal wall thickness. No propagation of iron oxide to the concrete surface was noted, which would have been indicative of steel containment vessel corrosion below the concrete. The concrete floor above the embedded steel containment vessel is examined as part of the Structures Monitoring Program (**B.2.1.36**). Based on existing inspection documentation and maintenance practices, this area has not exhibited signs of accelerated degradation.

The penetration bellows at BFN have no documented failures as a result of routine testing by the BFN Appendix J program or inspections conducted by the Containment Inservice Inspection Program.

Inspections conducted under the Containment Inservice Inspection Program identified some damaged areas of the moisture seal barrier (gaps, cracks, low areas/spots, or other surface irregularities) in Units 2 and 3 that required repair.

Conclusion

The continued implementation of the ASME B&PV Code Section XI Subsection IWE Inservice Inspection Program provides reasonable assurance that the aging effects will be managed so that the structures within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.33 ASME Section XI Subsection IWF Program

Program Description

10 CFR 50.55a imposes the inservice inspection requirements of the ASME B&PV Code Section XI for Class 1, 2, and 3 piping and component supports. The ASME B&PV Code Section XI Subsection IWF Inservice Inspection program includes periodic visual examination of a sample of Class 1, 2, 3 and MC supports. The sample size varies depending on the ASME Class.

As required by 10 CFR 50.55a paragraph (g)(4)(ii), the ASME B&PV Code Section XI Subsection IWF Inservice Inspection program will incorporate the requirements of the latest edition and addenda of the ASME B&PV Code incorporated by reference into 10 CFR 50.55a paragraph (b) 12 months prior to the start of each 120-month inspection interval, subject to the limitations and modifications listed in 10 CFR 50.55a paragraph (b) and with alternatives as authorized by the NRC in accordance with 10 CFR 50.55a paragraph (a)(3) and paragraph (g)(6).

Inspection of equivalent Class 1, 2, and 3 piping and component supports covered in Subsections IWF, is performed in accordance with the 1995 edition through the 1996 addenda for the Units 1 and 2 current inspection interval. Inspection of equivalent Class 1, 2, and 3 piping and component supports covered in Subsections IWF, is performed in accordance with the 1989 edition and Code Case N-491 “Alternative Rules for Examination of Class 1, 2, 3, and MC Component Supports of Light-Water Power Plants, Section XI Division 1”, for the Unit 3 current inspection interval.

NUREG-1801 Consistency

The ASME B&PV Code Section XI Subsection IWF Inservice Inspection program is an existing program that takes exception to NUREG-1801 XI.S3 evaluation elements.

Exceptions to NUREG-1801

The aging effects for supports of MC components will be managed by the Structures Monitoring Program (**B.2.1.36**), or Water Chemistry Program (**B.2.1.5**) with associated One-Time Inspection Program (**B.2.1.29**) for submerged supports during the extended period of operation.

<u>Program Element Affected</u>:

Element 1 - Scope of Program

“For Class 1 piping and component supports, Subsection IWF (1989 edition) refers to Subsection IWB for the inspection scope and schedule. According to Table IWB-2500-1, only 25% of nonexempt supports are subject to examination. Supports exempt from examination are the supports for piping systems that are exempt from examination, according to pipe diameter or service. The same supports are inspected in each 10-year inspection interval. For Class 2, 3, and MC piping and component supports, Subsection IWF (1989 edition) refers to Subsections IWC, IWD and IWE for the inspection scope and schedule. According to Table IWC-2500-1, 7.5% of nonexempt supports are subject to examination for Class 2 systems. The same supports are inspected in each 10-year inspection interval. No specific numerical percentages are identified in Subsections IWD and IWE for Class 3 and Class MC, respectively.

Starting with the 1990 addenda to the 1989 edition, the scope of Subsection IWF was revised. The required percentages of each type of nonexempt support subject to examination were incorporated into Table IWF-2500-1. The revised percentages are 25% of Class 1 nonexempt piping supports, 15% of Class 2 nonexempt piping supports, 10% of Class 3 nonexempt piping supports, and 100% of supports other than piping supports (Class 1, 2, 3, and MC). For pipe supports, the total sample consists of supports from each system (such as main steam, feedwater, and residual heat removal), where the individual sample sizes are proportional to the total number of nonexempt supports of each type and function within each system. For multiple components other than piping, within a system of similar design, function, and service, the supports of only one of the multiple components are required to be examined. To the extent practical, the same supports selected for examination during the first inspection interval are examined during each successive inspection interval."

BFN Evaluation

10 CFR 50.55a(g)(4) does not require inspection of supports for MC components using the ASME Section XI IWF Inservice Inspection Program. Accessible supports for MC components will be inspected by the Structures Monitoring Program.

Enhancements

None

Conclusion

The continued implementation of the ASME B&PV Code Section XI Subsection IWF Inservice Inspection program provides reasonable assurance that the aging effects will be managed so that the structures within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.34 10 CFR 50 Appendix J Program

Program Description

The 10 CFR 50 Appendix J program monitors leakage rates through the containment pressure boundary (including the drywell and torus, penetrations, fittings, and other access openings) in order to detect degradation of the primary containment pressure boundary. Seals, gaskets, and bolted connections are also monitored. Type A and Type B containment leak rate tests are performed in accordance with the regulations in 10 CFR 50 Appendix J Option B; and the guidance provided in Regulatory Guide 1.163, "Performance-Based Containment Leak-Testing Program;" NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50 Appendix J."

The 10 CFR 50 Appendix J program requirements are mandated by Technical Specification 5.5.12, Primary Containment Leakage Rate Testing Program. Additional requirements for testing the containment are mandated by the following Technical Specifications surveillance requirements: SR 3.6.1.1.1, SR 3.6.1.2.1, SR 3.6.1.2.10, and SR 3.6.1.2.11.

NUREG-1801 Consistency

The 10 CFR 50 Appendix J program is an existing program that is consistent with the NUREG-1801 XI.S4 evaluation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Testing in accordance with 10 CFR 50 Appendix J has been effective in monitoring the pressure integrity of the primary containment boundaries industry-wide and at BFN.

Conclusion

The continued implementation of the 10 CFR Part 50 Appendix J program provides reasonable assurance that the aging effects will be managed so that the structures and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.35 Masonry Wall Program

Program Description

The Masonry Wall program provides for condition monitoring of masonry walls. The program is included in the Structures Monitoring Program (SMP) (**B.2.1.36**) that implements the structures monitoring requirements of 10 CFR 50.65. Masonry wall condition monitoring is based on guidance provided in NRC Bulletin 80-11 "Masonry Wall Design" and Information Notice 87-67 "Lessons Learned from Regional Inspections of Licensee Actions in Response to I.E. Bulletin 80-11". Visual inspections are performed consistent with techniques identified in industry codes and standards such as ACI 349.3 R-96, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," and ANSI/ASCE 11-90, "Guideline for Structural Condition Assessment of Existing Buildings."

NUREG-1801 Consistency

The Masonry Wall program is an existing program that, with an enhancement, will be consistent with the NUREG-1801 XI.S5 evaluation.

Exceptions to NUREG-1801

None

Enhancement

Program procedures will be revised so that structures with masonry walls within the scope of license renewal are clearly identified and the qualification requirements for personnel who perform masonry wall walkdowns within the scope of license renewal are clarified.

This enhancement is scheduled to be completed prior to entering the period of extended operation.

Program Elements Affected:

Element 1 - Scope of Program

"The scope includes all masonry walls identified as performing intended functions in accordance with 10 CFR 54.4."

Element 3 - Parameters Monitored or Inspected

"The primary parameter monitored is wall cracking that could potentially invalidate the evaluation basis "

Element 4 - Detection of aging effects

"Visual examination of the masonry walls by qualified inspection personnel is sufficient. The frequency of inspection is selected to ensure there is no loss of intended function between inspections. The inspection frequency may vary from wall to wall, depending on the significance of cracking in the evaluation basis. Un-reinforced masonry walls that have not been contained by bracing warrant the most frequent inspection, because the development of cracks may invalidate the existing evaluation basis."

BFN Evaluation

With the implementation of this enhancement, BFN will ensure continued consistency with the affected program elements.

Operating Experience

Plant specific performance results of the Masonry Wall program as implemented by the Structures Monitoring Program that implements the requirements of 10 CFR 50.65 were reviewed. The program has been shown to be generally effective in managing aging effects of structural features and components. Some specific examples of industry operating experience of component degradation are included in NUREG-1801 XI-S.7. Below is a highlight of the plant-specific operating experience. None of the identified indications were considered significant or affected the function of a structure:

- Unit 1 Reactor Building - Mortar was missing at one end of a masonry block in a stair well.
- Unit 2 Reactor Building - There was localized cracking, apparently from door impact, in a masonry wall mortar joint adjacent to door .
- Unit 3 Reactor Building - A mortar bed had a horizontal crack. .
- Reactor Building Control Bay, Units 1, 2, and 3 - There were hairline cracks in mortar joints of top blocks of door framing.
- Reactor Building Control Bay, Units 1, 2, and 3 - There were a small number of hairline cracks.
- Unit 1 Turbine Building - A pre-cast lintel above metal door had hairline cracks.
- Unit 2 Turbine Building - There were hairline cracks observed in mortar near lintel above door.
- Unit 2 Turbine Building - Mortar was missing in a portion of the wall.

Conclusion

The continued implementation of the Masonry Wall Program as implemented by the Structures Monitoring Program provides reasonable assurance that the aging effects will be managed so that the structures within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.36 Structures Monitoring Program

Program Description

The Structures Monitoring Program includes periodic inspection and monitoring of the condition of accessible areas of structures. The Structures Monitoring Program implements the requirements of 10 CFR 50.65, the Maintenance Rule, program that incorporates the guidance of Nuclear Regulatory Commission Regulatory Guide 1.160, Rev. 2, and NUMARC 93-01, Rev. 2. The Structures Monitoring Program provides inspection guidelines and walkdown checklist for concrete features, roofs, structural steel, masonry walls, seismic gaps, tanks, earthen structures, buried piping, and miscellaneous components such as doors.

NUREG-1801 Consistency

The Structures Monitoring Program is an existing program that, with the following enhancements, will be consistent with the NUREG-1801 XI.S6 evaluation.

Exceptions to NUREG-1801

None

Enhancements

Enhancement 1

Enhance procedures implementing the 10 CFR 50.65 Maintenance Rule Program to identify all structures and structural components within the scope of license renewal and all aging effects and associated mechanisms for inspection.

This enhancement is scheduled to be complete prior to entering the period of extended operation.

> Program Elements Affected:
>
> Element 1 - Scope of Program
>
> "The applicant specifies the structure/aging effect combinations that are managed by its structures monitoring program."
>
> Element 3 - Parameters Monitored or Inspected
>
> "For each structure/aging effect combination, the specific parameters monitored or inspected are selected to ensure that aging degradation leading to loss of intended functions will be detected and the extent of degradation can be determined. Parameters monitored or inspected are to be commensurate with industry codes, standards and guidelines, and are to also consider industry and plant-specific operating experience. Although not required, ACI 349.3R-96 and ANSI/ASCE 11-90

provide an acceptable basis for selection of parameters to be monitored or inspected for concrete and steel structural elements and for steel liners, joints, coatings, and waterproofing membranes (if applicable). If necessary for managing settlement and erosion of porous concrete subfoundations, the continued functionality of a site de-watering system is to be monitored. The plant-specific structures monitoring program is to contain sufficient detail on parameters monitored or inspected to conclude that this program attribute is satisfied. "

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program elements.

Enhancement 2

Enhance procedures implementing the 10 CFR 50.65 Maintenance Rule program sampling approach to include examinations of representative samples of below-grade concrete when excavated for any reason.

This enhancement is scheduled to be complete prior to entering the period of extended operation.

Program Element Affected:

Element 4 - Detection of aging effects

"For each structure/aging effect combination, the inspection methods, inspection schedule, and inspector qualifications are selected to ensure that aging degradation will be detected and quantified before there is loss of intended functions. Inspection methods, inspection schedule, and inspector qualifications are to be commensurate with industry codes, standards and guidelines, and are to also consider industry and plant-specific operating experience. Although not required, ACI 349.3R-96 and ANSI/ASCE 11-90 provide an acceptable basis for addressing detection of aging effects. The plant-specific structures monitoring program is to contain sufficient detail on detection to conclude that this program attribute is satisfied. "

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element.

Enhancement 3

Enhance procedures implementing the 10 CFR 50.65, The Maintenance Rule, program to include the guidance provided in ACI 349.3R-96 Chapter 7 to clarify the "suitably knowledgeable or trained" inspector qualifications to "training and proficiency demonstration of inspectors for structural aging effects and long term performance issues". The procedures will also be clarified to identify the "responsible engineer" as the "structures monitoring program engineer" to avoid confusion with industry guidance.

This enhancement is scheduled to be complete prior to entering the period of extended operation.

Program Element Affected:

Element 4 - Detection of aging effects

"For each structure/aging effect combination, the inspection methods, inspection schedule, and inspector qualifications are selected to ensure that aging degradation will be detected and quantified before there is loss of intended functions. Inspection methods, inspection schedule, and inspector qualifications are to be commensurate with industry codes, standards and guidelines, and are to also consider industry and plant-specific operating experience. Although not required, ACI 349.3R-96 and ANSI/ASCE 11-90 provide an acceptable basis for addressing detection of aging effects. The plant-specific structures monitoring program is to contain sufficient detail on detection to conclude that this program attribute is satisfied. "

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element.

Operating Experience

Plant specific performance results of the Structures Monitoring Program were reviewed. The program has been shown to be generally effective in managing aging effects of structural features and components. Some specific examples of industry operating experience of component degradation are included in NUREG-1801 XI-S.7. Below is a highlight of the plant-specific operating experience:

- Reactor Buildings:
    - Minor concrete spalling at top of embedded plate (Unit 3)
    - Grout missing from platform supports – work order initiated (Unit 3)
    - Minor roof leak – work order initiated (Unit 3)
    - Minor surface rust on baseplates (Unit 2)

    - Scarified concrete walls and floors (Unit 2)
    - Crack in baseplate grout (Unit 2 Control Bay)
    - Roof flashing degraded (Unit 2 roof)
- Chimney - small spalling and cracking
- Unit 2 Turbine Building - baseplate grout missing
- 500KV Switchyard, 161KV Switchyard and Transformer Yard - cracking and spalling of various foundations
- RHRSW Tunnel - Rust on tunnel steel

These and other degraded conditions were determined to be insignificant with regard to structural adequacy; but were dispositioned in accordance with the Maintenance Rule program by methods such as repair, cause determination, cause mitigation, or monitoring to ensure the continued availability of the function.

Conclusion

The continued implementation of the Structures Monitoring Program provides reasonable assurance that the aging effects will be managed so that the structures within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.37 Inspection of Water-Control Structures Program

Program Description

The Inspection of Water-Control Structures program manages age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect water-control structures. BFN is not committed to RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," but has a program in place that is consistent with the elements of the RG 1.127 as evaluated in NUREG-1801.

The program is included in the Structures Monitoring Program (**B.2.1.36**) that implements the structures monitoring requirements of 10 CFR 50.65.

The Inspection of Water-Control Structures program includes inservice inspection and surveillance activities for dams, slopes, canals, and other water-control structures.

NUREG-1801 Consistency

The Inspection of Water-Control Structures program is an existing program that requires enhancement to be consistent with other NUREG-1801 XI.S7 evaluation elements.

Exceptions to NUREG-1801

None

Enhancements

Enhancement 1

Enhance program documents to ensure that required structures and structural components within the scope of license renewal are identified.

This enhancement is scheduled to be completed prior to entering the period of extended operation.

> Program Element Affected:
>
> Element 3 - Parameters Monitored or Inspected
>
> "RG 1.127 identifies the parameters to be monitored and inspected for water-control structures. The parameters vary depending on the particular structure. Parameters to be monitored and inspected for concrete structures include cracking, movements (e.g., settlement, heaving, deflection), conditions at junctions with abutments and embankments, erosion, cavitation, seepage, and leakage. Parameters to be monitored and inspected for earthen embankment structures include settlement, depressions, sink holes, slope stability (e.g., irregularities in alignment and variances from originally constructed slopes), seepage, proper functioning of drainage systems, and degradation of slope protection features. Further details of parameters to be monitored and inspected for these and other water-control structures are specified in Section C.2 of RG 1.127."

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element.

<u>Enhancement 2</u>

Program documents will be enhanced to include special inspections following the occurrence of large floods, earthquakes, tornadoes, and intense rainfall.

This enhancement is scheduled to be completed prior to entering the period of extended operation.

Program Element Affected:

Element 4 - Detection of aging effects

"Visual inspections are primarily used to detect degradation of water-control structures. In some cases, instruments have been installed to measure the behavior of water-control structures. RG 1.127 indicates that the available records and readings of installed instruments are to be reviewed to detect any unusual performance or distress that may be indicative of degradation. RG 1.127 describes periodic inspections, to be performed at least once every five years. Similar intervals of five years are specified in ACI 349.3R for inspection of structures continually exposed to fluids or retaining fluids. Such intervals have been shown to be adequate to detect degradation of water-control structures before they have a significant effect on plant safety. RG 1.127 also describes special inspections immediately following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls. "

BFN Evaluation

With the implementation of this enhancement, BFN will be consistent with the affected program element.

Operating Experience

Plant specific performance results of the Inspection of Water-Control Structures program as implemented by the Structures Monitoring Program that implements the requirements of 10 CFR 50.65 were reviewed. The program has been shown to be generally effective in managing aging effects of structural features and components. Specific examples of industry operating experience of component degradation are included in NUREG-1801 XI-S.7. Below is a highlight of the plant-specific operating experience. None of the identified indications were considered significant or affected the function of a structure:

- Intake Pumping Station: Very minor concrete surface cracks and platform grating clipped.
- Gate Structure No. 3: Very minor concrete surface cracks and spalling

Conclusion

The continued implementation of the Inspection of Water-Control Structures program provides reasonable assurance that the aging effects will be managed so that the structures within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.38 Protective Coating Monitoring and Maintenance Program

At BFN, coatings do not have an intended function. In addition, BFN does not utilize ASME code exceptions that credit the use of coatings for corrosion protection. Therefore, a Protective Coating Monitoring and Maintenance Program will not be credited for license renewal.

B.2.1.39 Systems Monitoring Program

The Systems Monitoring Program is an existing plant-specific program that consists of the appropriate ten elements described in Appendix A of NUREG-1800. The BFN Systems Monitoring Program is a condition monitoring program that includes periodic visual inspections of systems' and components' material condition, operation, and configuration. System visual inspections identify degraded conditions prior to the loss of the systems' and components' intended function.

Aging Management Program Elements

The requirements of the Systems Monitoring Program are described below along with an evaluation of the program to the criteria of the required program elements of Appendix A of NUREG-1800.

Element 1 - Scope of Program

"The scope of the program should include the specific structures and components of which the program manages the aging."

BFN Description and Evaluation

The program includes requirements for visual inspections to identify material condition (i.e., loss of material, corrosion etc.) of surfaces of systems and components within the scope of license renewal as identified in the Aging Management Reviews.

Element 2 - Preventive Actions

"The activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation."

BFN Description and Evaluation

The BFN Systems Monitoring Program is a condition monitoring program. No preventive actions are included in the program.

Element 3 - Parameters Monitored or Inspected

"The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended functions. For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. For a performance monitoring program, a link should be established between the degradation of the particular structure or component intended functions and the parameter(s) being monitored. For prevention and mitigation programs, the parameters monitored should be the specific parameters being controlled to achieve prevention or mitigation of aging effects."

BFN Description and Evaluation

The System Monitoring Program includes visual inspections to identify material condition (i.e, loss of material, corrosion etc.) of surfaces of systems and components prior to the loss of their intended function. Corrective maintenance or corrective action documents are initiated to ensure identified deficiencies identified are tracked, trended, and corrected.

Element 4 - Detection of Aging Effects

"Detection of aging effects should occur before there is a loss of the structure and component intended functions. The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended functions will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects. Provide information that links the parameters to be monitored or inspected to the aging effects being managed."

BFN Description and Evaluation

The System Monitoring Program includes visual inspections to identify material condition (i.e., loss of material, corrosion etc.) of surfaces of systems and components to detect aging effects prior to the loss of their intended function. The system visual inspections are performed on a periodic basis (quarterly) and provide for data collection on systems and components for monitoring and trending to ensure timely detection of aging effects.

Element 5 - Monitoring and Trending

"Monitoring and trending activities should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency."

BFN Description and Evaluation

The inspected systems and components are monitored, trended, and documented by the use of the System Health Reports (Quarterly), the Corrective Action Program, and the Corrective Maintenance program. Corrective Action and Corrective Maintenance program documents are tracked, trended, and scheduled to ensure actions are taken in a timely manner to correct or mitigate any effects of aging deficiencies identified.

Element 6 - Acceptance Criteria

"The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended functions are maintained under all CLB design conditions during the period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria."

BFN Description and Evaluation

During a system or component visual inspection, System Engineers use their knowledge of the UFSAR, Technical Specifications, design basis documents, operating experience, and plant operating, technical, and maintenance procedures to evaluate system physical attributes and operational characteristics. This includes visual inspections to identify material condition (i.e., loss of material, corrosion etc.) of surfaces of systems and components. The intent is to ensure systems are operated within both the requirements of facility procedures and the plant design bases.

Element 7 - Corrective Actions

"Actions to be taken when the acceptance criteria are not met should be described. Corrective actions, including root cause determination and prevention of recurrence, should be timely.

If corrective actions permit analysis without repair or replacement, the analysis should ensure that the structure and component intended functions will be maintained consistent with the CLB."

BFN Description and Evaluation

Corrective actions are taken in accordance with the Quality Assurance Program. An evaluation of the Quality Assurance Program is provided in Section **B.1.3**.

Element 8 - Confirmation Process

"The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective. The effectiveness of prevention and mitigation programs should be verified periodically. When corrective actions are necessary, there should be follow-up activities to confirm that the corrective actions were completed, the root cause determination was performed, and recurrence is prevented."

BFN Description and Evaluation

The confirmation process is part of the corrective action process implemented in accordance with the Quality Assurance Program. An evaluation of the Quality Assurance Program is provided in Section **B.1.3**.

Element 9 - Administrative Controls

"The administrative controls of the program should provide a formal review and approval process. Any AMPs to be relied on for license renewal should have regulatory and administrative controls."

BFN Description and Evaluation

Administrative controls are implemented in accordance with the Quality Assurance Program. An evaluation of the Quality Assurance Program is provided in Section **B.1.3**.

Element 10 - Operating Experience

"The operating experience of AMPs, including past corrective actions resulting in program enhancements or additional programs, should be considered. A past failure would not necessarily invalidate an AMP because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information can show where an existing program has succeeded and where it has failed (if at all) in intercepting aging degradation in a timely manner. This information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended functions will be maintained during the period of extended operation. An applicant may have to commit to providing operating experience in the future for new programs to confirm their effectiveness."

BFN Description and Evaluation

The System Monitoring Program produces System Health Reports which provide a quarterly review of systems and components operating experience. This includes corrective actions that have been taken and resulted in enhancements to systems and components. The System Monitoring Program and System Health Reports have identified age related degradation and material conditions of systems and components. The effectiveness of the corrective actions have been evaluated and documented in the System Health Reports.

Conclusion

The continued implementation of the Systems Monitoring Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.2.1.40 Bus Inspection Program

The Bus Inspection Program is a new program that will provide reasonable assurance that the intended functions of isolated and nonsegregated phase bus will be maintained consistent with the current licensing basis through the period of extended operation. This program will manage nonsegregated phase bus insulation exposed to adverse localized environments caused by heat in the presence of oxygen and loosening of fastening hardware associated with isolated and non-segregated phase bus due to cyclic loading resulting in thermal expansion and contraction of the bus. The program will also include inspection of the bus enclosure.

This program will manage all in-scope portions of isolated and non-segregated phase bus associated with the unit station service transformers, main transformers, and common station service transformers.

The aging mechanisms managed by this program include degradation of the non-segregated phase bus insulation caused by heat in the presence of oxygen and cyclic loading of isolated and non-segregated phase bus causing thermal expansion and contraction of the bus, which could loosen the bus connection fastening hardware of the bus. Any one of these conditions could lead to a failure, preventing the phase bus from performing its intended function.

The program will be performed in conjunction with routine maintenance activities. The program will include visual inspection and electrical testing of in-scope non-segregated phase bus for evidence of loosened bolted bus connections and damage to bus insulation. The program will also include visual inspection and electrical testing of in-scope isolated phase bus for evidence of loosened bolted bus connections and visual inspection of the in-scope isolated and non-segregated phase bus enclosure for excessive dust build up, evidence of water intrusion, and debris.

<u>Aging Management Program Elements</u>

The requirements of the “Bus Inspection Program” are described below along with an evaluation of the program in accordance with the program elements of Appendix A of NUREG-1800.

Element 1 - Scope of Program

“The scope of the program should include the specific structures and components of which the program manages the aging.”

BFN Description and Evaluation

The scope of this program will include inspections and tests of in-scope portions of isolated and non-segregated phase bus associated with the unit station service transformers, main transformers, and common station service transformers.

Element 2 - Preventive Actions

"The activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation."

BFN Description and Evaluation

The Bus Inspection Program will be a condition monitoring program. No actions will be taken as part of this program to prevent or mitigate aging degradation.

Element 3 - Parameters Monitored or Inspected

"The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended functions. For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. For a performance monitoring program, a link should be established between the degradation of the particular structure or component intended functions and the parameter(s) being monitored. For prevention and mitigation programs, the parameters monitored should be the specific parameters being controlled to achieve prevention or mitigation of aging effects."

BFN Description and Evaluation

Bus insulation will be visually inspected for embrittlement, cracking, melting, discoloration, or other damage. In addition, the bus insulation will be tested using a proven test for detecting deterioration of the insulation system, such as insulation resistance, or other testing that is state-of-the-art at the time the test is performed. The specific type of test performed will be determined prior to the initial test.

Bolted bus connections will be visually inspected for evidence of burning or heat up on tape connections, loose connections or arcing on boot type cover sleeves, and evidence of tracking, corrosion, or ground faults on uninsulated connections. In addition, the bolted bus connections will be tested using a proven test for detecting deterioration of the bolted connection, such as micro-ohm resistance, or other testing that is state-of-the-art at the time the test is performed. The specific type of test performed will be determined prior to the initial test.

The bus enclosure will be visually inspected for foreign debris, excessive dust build up, and evidence of water intrusion.

Element 4 - Detection of Aging Effects

"Detection of aging effects should occur before there is a loss of the structure and component intended functions. The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended functions will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects. Provide information that links the parameters to be monitored or inspected to the aging effects being managed."

BFN Description and Evaluation

The detection of aging effects will commence prior to the expiration of the current 40-year license for each unit, and will be conducted at least once every 10 years thereafter throughout the period of extended operation.

Element 5 - Monitoring and Trending

"Monitoring and trending activities should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency."

BFN Description and Evaluation

Trending is not a required attribute of this program.

Element 6 - Acceptance Criteria

"The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended functions are maintained under all CLB design conditions during the period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria."

BFN Description and Evaluation

The acceptance criteria are qualitative. Phase bus insulation must be free of embrittlement, cracking, melting, discoloration, or other damage and pass the acceptance criteria established for the test being performed. The bus enclosure shall be free of foreign debris, excessive dust build up, and evidence of water intrusion. Bolted bus connection splices shall not have any of the following signs:

- For taped connections: tape burning/heating up, tape cracking, corona effects, or other damage
- For boot type cover splices: "as found" loose connections and arcing damage
- For uninsulated connections: evidence of tracking, corrosion, or ground faults

And shall pass the acceptance criteria established for the test being performed.

Element 7 - Corrective Actions

"Actions to be taken when the acceptance criteria are not met should be described. Corrective actions, including root cause determination and prevention of recurrence, should be timely. If corrective actions permit analysis without repair or replacement, the analysis should ensure that the structure and component intended functions will be maintained consistent with the CLB."

BFN Description and Evaluation

Corrective actions are taken in accordance with the Quality Assurance Program. The TVA Nuclear Quality Assurance Plan implements the requirements of 10CFR 50 Appendix B and is consistent with the summary in Appendix A.2 of NUREG-1800 as described in Section **B.1.3**. The Quality Assurance Plan includes the element of corrective action and is applicable to the components managed by this AMP.

Element 8 - Confirmation Process

"The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective. The effectiveness of prevention and mitigation programs should be verified periodically. When corrective actions are necessary, there should be follow-up activities to confirm that the corrective actions were completed, the root cause determination was performed, and recurrence is prevented."

BFN Description and Evaluation

The confirmation process is part of the corrective action process implemented in accordance with the Quality Assurance Program. The TVA Nuclear Quality Assurance Plan implements the requirements of 10CFR 50 Appendix B, and is consistent with the summary in Appendix A.2 of NUREG-1800 as described in Section **B.1.3**. The Quality Assurance Plan includes the element of confirmation process and is applicable to the components managed by this AMP.

Element 9 - Administrative Controls

"The administrative controls of the program should provide a formal review and approval process. Any AMPs to be relied on for license renewal should have regulatory and administrative controls."

BFN Description and Evaluation

Administrative controls are implemented in accordance with the Quality Assurance Program. An evaluation of the Quality Assurance Program is provided in Section **B.1.3**.

Element 10 - Operating experience

“The operating experience of AMPs, including past corrective actions resulting in program enhancements or additional programs, should be considered. A past failure would not necessarily invalidate an AMP because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information can show where an existing program has succeeded and where it has failed (if at all) in intercepting aging degradation in a timely manner. This information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended functions will be maintained during the period of extended operation. An applicant may have to commit to providing operating experience in the future for new programs to confirm their effectiveness.”

BFN Description and Evaluation

This is a new AMP. Therefore no operating experience exists.

Conclusion

Based on implementation of the Bus Inspection Program, there is reasonable assurance that the aging effects of non-segregated phase bus insulation and loosening of fastening hardware associated with isolated and non-segregated phase bus will be adequately managed such that isolated and non-segregated phase bus will continue to perform its intended functions for the period of extended operation.

B.2.1.41 Diesel Starting Air Program

The Diesel Starting Air Program is an existing program that includes:

(a) Preventive actions - Filter and desiccant replacement minimizes corrosion and corrosion product buildup.

(b) Condition monitoring - Periodic inspections verify the effectiveness of the preventive actions and detect and correct degraded conditions prior to loss of function.

The Diesel Starting Air Program is implemented by preventive maintenance procedures. The frequencies for replacements and inspections are established and maintained in accordance with the Preventive Maintenance Program. An inspection of the diesel starting air piping and receivers for loss of material will be performed using the One-Time Inspection Program (**B.2.1.29**).

Aging Management Program Elements

The requirements of the Diesel Starting Air Program are described below along with an evaluation of the program demonstrating compliance with the program elements of Appendix A of NUREG-1800.

Element 1 - Scope of Program

"The scope of the program should include the specific structures and components of which the program manages the aging."

BFN Description and Evaluation

The scope of the program includes the starting air systems for the emergency diesel generators.

Element 2 - Preventive Actions

"The activities for prevention and mitigation programs should be described. These actions should mitigate or prevent aging degradation."

BFN Description and Evaluation

Preventive actions include filter replacement and desiccant replacement. These actions maintain an environment that minimizes internal corrosion and corrosion product buildup.

Element 3 - Parameters Monitored or Inspected

"The parameters to be monitored or inspected should be identified and linked to the degradation of the particular structure and component intended functions. For a condition monitoring program, the parameter monitored or inspected should detect the presence and extent of aging effects. For a performance monitoring program, a link should be established between the degradation of the particular structure or component intended functions and the parameter(s) being monitored. For prevention and mitigation programs, the parameters monitored should be the specific parameters being controlled to achieve prevention or mitigation of aging effects."

BFN Description and Evaluation

The Diesel Generator Starting Air Program provides for periodic inspection of moisture traps, pilot valves, and lift check valves for corrosion, erosion, pitting, and wear of components.

Element 4 - Detection of Aging Effects

"Detection of aging effects should occur before there is a loss of the structure and component intended functions. The parameters to be monitored or inspected should be appropriate to ensure that the structure and component intended functions will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency, sample size, data collection and timing of new/one-time inspections to ensure timely detection of aging effects. Provide information that links the parameters to be monitored or inspected to the aging effects being managed."

BFN Description and Evaluation

The Diesel Generator Starting Air Program requires periodic visual inspection of moisture traps, pilot valves, and lift check valves for corrosion, erosion, pitting, and wear of components. The Diesel Generator Starting Air Program activity frequencies are established and maintained in accordance with the plant Preventive Maintenance Program and Qualification Maintenance Data Sheets, as applicable, or as required for maintenance. This ensures that required program actions are taken before degradation causes a loss of function.

The diesel starting air piping and receivers will be inspected for loss of material using the One-Time Inspection Program (**B.2.1.29**).

Element 5 - Monitoring and Trending

"Monitoring and trending activities should provide predictability of the extent of degradation and thus effect timely corrective or mitigative actions. Plant-specific and/or industry-wide operating experience may be considered in evaluating the appropriateness of the technique and frequency."

BFN Description and Evaluation

The Diesel Generator Starting Air Program is implemented by the plant Preventive Maintenance Program that includes provisions for monitoring and trending. Failure to meet acceptance criteria requires the initiation of a Problem Evaluation Report of the Corrective Action Program.

Element 6 - Acceptance Criteria

"The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended functions are maintained under all CLB design conditions during the period of extended operation. The program should include a methodology for analyzing the results against applicable acceptance criteria."

BFN Description and Evaluation

The Diesel Generator Starting Air Program acceptance criteria are established and maintained in accordance with the plant Preventive Maintenance Program. The acceptance criteria are typically qualitative (e.g., the absence of corrosion). Corrective actions required due to a failure to meet an acceptance criterion are evaluated to ensure the intended functions will be maintained.

Element 7 - Corrective Actions

"Actions to be taken when the acceptance criteria are not met should be described. Corrective actions, including root cause determination and prevention of recurrence, should be timely. If corrective actions permit analysis without repair or replacement, the analysis should ensure that the structure and component intended functions will be maintained consistent with the CLB."

BFN Description and Evaluation

Corrective actions are taken in accordance with the Quality Assurance Program. The TVA Nuclear Quality Assurance Plan implements the requirements of 10CFR 50 Appendix B and is consistent with the summary in Appendix A.2 of NUREG-1800 as described in Section **B.1.3**. The Quality Assurance Plan includes the element of corrective action and is applicable to the components managed by this AMP.

Element 8 - Confirmation Process

"The confirmation process should ensure that preventive actions are adequate and that appropriate corrective actions have been completed and are effective. The effectiveness of prevention and mitigation programs should be verified periodically. When corrective actions are necessary, there should be follow-up activities to confirm that the corrective actions were completed, the root cause determination was performed, and recurrence is prevented."

BFN Description and Evaluation

The confirmation process is part of the corrective action process implemented in accordance with the Quality Assurance Program. The TVA Nuclear Quality Assurance Plan implements the requirements of 10CFR 50 Appendix B, and is consistent with the summary in Appendix A.2 of NUREG-1800 as described in Section **B.1.3**. The Quality Assurance Plan includes the element of confirmation process and is applicable to the components managed by this AMP.

Element 9 - Administrative Controls

"The administrative controls of the program should provide a formal review and approval process. Any AMPs to be relied on for license renewal should have regulatory and administrative controls."

BFN Description and Evaluation

Administrative controls are implemented in accordance with the Quality Assurance Program. An evaluation of the Quality Assurance Program is provided in Section **B.1.3**.

Element 10 - Operating experience

"The operating experience of AMPs, including past corrective actions resulting in program enhancements or additional programs, should be considered. A past failure would not necessarily invalidate an AMP because the feedback from operating experience should have resulted in appropriate program enhancements or new programs. This information can show where an existing program has succeeded and where it has failed (if at all) in intercepting aging degradation in a timely manner. This information should provide objective evidence to support the conclusion that the effects of aging will be managed adequately so that the structure and component intended functions will be maintained during the period of extended operation. An applicant may have to commit to providing operating experience in the future for new programs to confirm their effectiveness."

BFN Description and Evaluation

During the 1980s the Diesel Generator air start system experienced failures of the air start solenoid valves during a start sequence. These events were reported to the NRC in LER 86-008-00 and LER 89-018-00. The air start motor did not disengage due to corrosion debris which pitted the air solenoid valve seats preventing the air start solenoid valves from completely closing.

Corrective actions to prevent recurrence of the events included:

- Modification of the system in the late 1980s to minimize corrosion by installing air dryers and moisture traps.
- Periodic maintenance activities including replacement of filters and desiccant and inspections of system components to verify the effectiveness of the modifications and replacements.

The corrective actions have prevented recurrence of the problems identified in LER 86-008-00 and in LER 89-018-00.

Conclusion

The continued implementation of the Diesel Starting Air Program provides reasonable assurance that the aging effects will be managed so that the systems and components within the scope of this program will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

B.3.0 TIME-LIMITED AGING ANALYSIS EVALUATIONS OF AGING MANAGEMENT PROGRAMS UNDER 10 CFR 54.21(c)(1)(iii)

The correlation between NUREG-1801 Volume 2 Chapter X programs and the BFN programs are shown below. Links to appropriate sections of this appendix are provided.

NUREG-1801 NUMBER	NUREG-1801 PROGRAM	BFN PROGRAM
X.E1	Environmental Qualification (EQ) of Electrical Components	Environmental Qualification Program (**B.3.1**)
X.M1	Metal Fatigue of Reactor Coolant Pressure Boundary	Metal Fatigue (**B.3.2**)
X.S1	Concrete Containment Tendon Prestress	Not applicable to BFN. (**B.3.3)**

B.3.1 Environmental Qualification Program

Program Description

The Environmental Qualification Program is mandated by 10 CFR 50.49. The Environmental Qualification Program identifies components subject to 10 CFR 50.49 requirements and manages component thermal, radiation, and cyclical aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. Components subject to 10 CFR 50.49 requirements, that are not qualified for the license term, must be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in their evaluation. Aging evaluations for EQ components that specify a qualification of at least 40 years are considered TLAAs for license renewal. The TLAA analysis and disposition is presented in Section **4.4**. The Environmental Qualification Program will ensure that the components subject to 10 CFR 50.49 requirements are maintained within the bounds of their qualification bases for the period of extended operation.

BFN plant procedures define the responsibilities and specify the requirements to establish and maintain auditable documentation demonstrating qualification of equipment in compliance with 10 CFR 50.49. The scope of equipment included in the Environmental Qualification Program is identified in plant controlled equipment databases. (**F.4**)

Qualification documentation of equipment subject to 10 CFR 50.49 is specific (that is, a particular piece of equipment, typically unique to a specific manufacturer and model number, has unique documentation) and includes:

(a) Qualification criteria used (10 CFR 50.49, NUREG-0588 Cat I or II, or DOR Guidelines of IE Bulletin 79-01B).

(b) Method of qualification employed (test, test with supporting analysis, experience data, or analysis with partial type test that supports an analysis).

(c) Environmental parameters for normal, abnormal, and accident conditions.

(d) Component functional requirements.

(e) Electrical characteristics and performance specifications.

(f) Aging mechanisms and effects.

(g) Qualification test reports and/or supporting calculations.

Plant documentation also establishes component maintenance, surveillance, storage, and replacement interval requirements and history.

See Section **4.4** for a demonstration that the BFN Environmental Qualification Program is consistent with NRC guidance provided in NRC Regulatory Issue Summary 2003-09, “Environmental Qualification of Low Voltage Instrumentation & Control Cables.”

Note: Text enclosed in bold border is specific to Units 2 and 3 CLB.

NUREG-1801 Consistency

The Environmental Qualification Program is an existing program that was established to meet 10 CFR 50.49 requirements. It is consistent with NUREG-1801 Section X.E1, “Environmental Qualification (EQ) of Electric Components.”

Exceptions to NUREG-1801

None

Enhancements

The Environmental Qualification program will be implemented on Unit 1. The enhancement is scheduled for completion prior to Unit 1 restart from its current extended outage.

Program Element Affected:

Element 1 - Scope of Program

“EQ programs apply to certain electrical components that are important to safety and could be exposed to harsh environment accident conditions, as defined in 10 CFR 50.49. “

BFN Evaluation

With the implementation of this enhancement, the BFN EQ program will be consistent with the affected program element for all three units.

Operating Experience

Operating experience is a vital consideration in maintaining the current Environmental Qualification Program and in modifying qualification bases and conclusions, including qualified life. The engineering, technical, and programmatic requirements and processes followed in establishing and maintaining the Environmental Qualification Program include a review of licensing, industry, and other generic documentation for Environmental Qualification applications and involvement in various utility groups.

Conclusion

Based upon a review of the existing program and operating experience, the continued implementation of the EQ Program provides reasonable assurance that the applicable aging effects will be managed and that components subject to 10 CFR 50.49 requirements will continue to perform their intended functions for the period of extended operation.

B.3.2 Fatigue Monitoring Program

Description

The Fatigue Monitoring Program is used for management of metal fatigue of select components in the reactor coolant pressure boundary and primary containment. The Fatigue Monitoring Program provides for monitoring fatigue stress cycles to ensure that the design fatigue usage factor limit is not exceeded.

NUREG-1801 Consistency

The enhanced Fatigue Monitoring Program is consistent with the ten elements of AMP specified in NUREG-1801 Section X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary".

Exceptions

None

Enhancements

The enhanced Fatigue Monitoring Program will use the EPRI-licensed FatiguePro® cycle counting and fatigue usage tracking computer program. This program calculates stress cycles and resulting Cumulative Usage Factor (CUF) values from operating cycles. These calculations will be automated and performed periodically based on information downloads from the plant's instrumentation computers.

The enhancements will include expansion of the program coverage as follows:

- This program will include select Reactor Vessel locations as specified in Table **4.3.1.1**.
- This program will include the locations identified by NUREG/CR-6260 for environmental fatigue evaluation as discussed in Section **4.3.4** and in accordance with NUREG 1801 Section X.M1.
- This program will include monitoring the fatigue of the suppression chamber and suppression chamber vents, including the vent headers and downcomers, as specified in Section **4.6.1**.

TVA will implement all enhancements prior to the period of extended operation.

Operating Experience

Since the original licensing of BFN, the industry has sponsored the development of the EPRI-licensed FatiguePro® computer program. This action was taken in response to NRC concerns that early-life operating experience, at some units, had caused CUF values to increase at a faster rate than anticipated in the original plant design. This program provides for the incorporation of operating experience, and is designed to ensure that the CUF values do not exceed acceptable limits in the remainder of a unit's operating life.

Conclusion

The enhanced Fatigue Monitoring Program provides reasonable assurance that metal fatigue issues of the reactor coolant pressure boundary and in the primary containment, due to thermal and pressure transients, are managed, such that integrity of the subject components are maintained for the extended operating period of the plant.

B.3.3 Concrete Containment Tendon Prestress Program

This program is not applicable to BFN. The BFN containments do not utilize prestressed tendons.

B.4.0 REFERENCES

1. 10 CFR 50 Appendix B, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, U. S. Nuclear Regulatory Commission.
2. NUREG 1800 Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants, U.S. Nuclear Regulatory Commission, July 2001.
3. NUREG-1801, “Generic Aging Lessons Learned Report,” Volumes 1 and 2, NRC, July 2001.
4. NEI 95-10, Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule, Rev. 3, Nuclear Energy Institute, March 2001.

BROWNS FERRY NUCLEAR PLANT LICENSE RENEWAL APPLICATION

APPENDIX C

COMMODITY GROUPS
(Appendix C not used)

BROWNS FERRY NUCLEAR PLANT LICENSE RENEWAL APPLICATION

APPENDIX D

TECHNICAL SPECIFICATION CHANGES

10 CFR 54.22 requires that an application for license renewal include any technical specification changes or additions necessary to manage the effects of aging during the period of extended operation. A review of the information in this License Renewal Application and the Browns Ferry Nuclear Plant Technical Specifications determined that no changes to the Technical Specifications are required.