LICENSE RENEWAL APPLICATION

WATERFORD STEAM ELECTRIC STATION, UNIT 3

FACILITY OPERATING LICENSE NPF-38

MARCH 2016

PREFACE

The following describes the information location, layout, and editorial conventions in the Waterford Steam Electric Station, Unit 3 (Waterford 3 or WF3) License Renewal Application (LRA) (hereinafter referred to as "this application" or "the application"). Abbreviated names and acronyms used throughout the application are defined at the end of this preface. Commonly understood terms (such as U.S.) and terms used only in referenced document numbers may not be identified in this table. Regulatory documents such as NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, and 10 CFR 54, "Requirements for Renewal of Operating Licenses for Nuclear Power Plants," may be referred to by the document number, i.e., NUREG-1801 and 10 CFR 54, respectively. References to the FSAR are to the updated Waterford 3 Final Safety Analysis Report, Revision 308.

Section 1 provides administrative information required by 10 CFR 54.17 and 10 CFR 54.19.

Section 2 describes and justifies the methods used to determine the systems and structures within the scope of license renewal and the structures and components subject to aging management review. The results of the system and structure scoping are provided in Tables 2.2-1 through 2.2-5. Tables 2.2-1, 2.2-2 and 2.2-4 list mechanical systems, electrical and instrumentation and controls (I&C) systems, and structures, respectively, within the scope of license renewal. Tables 2.2-3 and 2.2-5 list the systems and structures, respectively, not within the scope of license renewal. Section 2 also provides descriptions of in-scope systems and structures and their intended functions with tables identifying components and commodities requiring aging management review and their component intended functions. References are provided to the results of the aging management reviews in Section 3. The descriptions of systems in Section 2 identify license renewal drawings that depict the components subject to aging management review for mechanical systems. The drawings are provided in a separate submittal.

Section 3 describes the results of aging management reviews of mechanical, electrical and structural components requiring aging management review. Section 3 is divided into sections that address (1) the reactor vessel, internals, and reactor coolant system, (2) engineered safety features, (3) auxiliary systems, (4) steam and power conversion systems, (5) containments, structures and component supports, and (6) electrical and I&C. The tables in Section 3 provide a summary of information concerning aging effects requiring management and applicable aging management programs for component and commodity groups subject to aging management review. The information presented in the tables is based on the format and content of NUREG-1800, *Standard Review Plan [SRP] for Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, U.S. Nuclear Regulatory Commission (NRC), December 2010, as modified by applicable NRC Interim Staff Guidance (ISG) documents for license renewal. The tables include comparisons with the evaluations documented in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 2, U.S. NRC, December 2010, as modified by applicable NRC ISG documents for license renewal.

Section 4 addresses time-limited aging analyses, as defined by 10 CFR 54.3. It includes identification of the component or subject and an explanation of the time-dependent aspects of the calculation or analysis. Section 4 demonstrates whether (1) the analyses remain valid for the period of extended operation, (2) the analyses have been projected to the end of the period of extended operation, or (3) the effects of aging on the intended function(s) will be adequately managed for the period of extended operation. Section 4 also documents the determination that no plant-specific exemptions granted pursuant to 10 CFR 50.12 that are based on time-limited aging analyses as defined in 10 CFR 54.3 will remain in effect.

Appendix A, Final Safety Analysis Report Supplement, provides a summary description of programs and activities for managing the effects of aging for the period of extended operation. A summary description of the evaluation of time-limited aging analyses for the period of extended operation is also included. Following issuance of the renewed license, the material contained in this appendix will be incorporated into the updated FSAR. The information in Appendix A fulfills the requirements in 10 CFR 54.21(d). Table 3.0-1, “FSAR Supplement for Aging Management of Applicable Systems,” from Revision 2 of NUREG-1800 was used as guidance for the content of the applicable aging management program summaries.

Appendix B, Aging Management Programs and Activities, describes aging management programs and activities that will manage aging effects on components and structures within the scope of license renewal such that they will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. Appendix B contains a comparison of site programs to the programs evaluated in NUREG-1801. The information in Section 2, Section 3, and Appendix B fulfills the requirements of 10 CFR 54.21(a).

Appendix C, Response to Selected Applicant/Licensee Action Items for Inspection and Evaluation Guidelines for PWR Internals, provides the Waterford 3 response to applicant action items identified in the Nuclear Regulatory Commission (NRC) safety evaluation (SE) of MRP-227, "Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines."

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

Appendix E is the environmental information that fulfills the requirements of 10 CFR 54.23 and 10 CFR 51.53(c).

ABBREVIATIONS AND ACRONYMS

Abbreviation or Acronym	Description
AC	alternating current
ACC	auxiliary component cooling water
ACI	American Concrete Institute
ACSR	aluminum conductor steel reinforced
ADG	auxiliary diesel generator
AE	air evacuation
AEM	aging effect/mechanism
Al	aluminum
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
ANP	annulus negative pressure
ARM	area radiation monitoring
ARR	airborne radioactivity removal
AS	auxiliary steam
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
BAM	boric acid makeup
BD	blowdown
BM	boron management
BTP	Branch Technical Position
BWR	boiling water reactor
C	centigrade
CAP	containment atmosphere purge
CASS	cast austenitic stainless steel

Abbreviation or Acronym	**Description**
CAR	containment atmosphere release
CB	containment building
CC	component cooling water
CCS	containment cooling HVAC system
CCWS	component cooling water system
CD	condensate
CE	conducts electricity, Combustion Engineering
CEA	control element assembly
CED	control element drive
CEDM	control element drive mechanisms
CF	chemical feed, chemistry factor
CFR	Code of Federal Regulations
CII	containment inservice inspection
CLB	current licensing basis
CMU	condensate makeup and storage
CS	containment spray, core shroud
CSP	condensate storage pool
Cu	copper
CUF	cumulative usage factor
CVAS	controlled ventilation area system
CVC	chemical and volume control
CVR	containment vacuum relief
CW	circulating water
DC	direct current
DCT	dry cooling tower
ΔRT	reference temperature change
EAF	environmentally assisted fatigue

Abbreviation or Acronym	Description
EBA	emergency breathing air
ECCS	emergency core cooling system
EDG	emergency diesel generator
EFPY	effective full power years
EFW	emergency feedwater
EN	enclosure protection
EPRI	Electric Power Research Institute
EQ	environmental qualification
ESF	engineered safety feature
ext	external
FAC	flow-accelerated corrosion
FB	fire barrier
FC	flow control
FD	flow distribution
F_{en}	environmentally assisted fatigue correction factor
FHS	fuel handling and storage
FLB	flood barrier
FP	fire protection
FS	fuel pool cooling and purification
FSAR	Final Safety Analysis Report
ft-lb	foot-pound
FW	main feedwater
GALL	Generic Aging Lessons Learned [NUREG-1801 report]
GL	Generic Letter
GSI	Generic Safety Issue
GWM	gaseous waste management

Abbreviation or Acronym	Description
H&V	heating and ventilation
HDPE	high density polyethylene
HELB	high-energy line break
HEPA	high efficiency particulate air
HPSI	high pressure safety injection
HRA	hydrogen recombiners and analyzers
HS	heat sink
HVAC	heating, ventilation, and air conditioning
HVC	control room heating, ventilation, and air conditioning
HVD	hot machine shop and decontamination facility ventilation
HVF	fuel handling building HVAC
HVR	reactor auxiliary building HVAC
HVT	turbine building ventilation
I&C	instrumentation and control
IA	instrument air
ICI	incore instrumentation
ICI/HJTC-CET	ICI/heated junction thermocouple-core exit thermocouples
ILRT	integrated leakage rate test
IN	insulation; [NRC] Information Notice
INPO	Institute of Nuclear Power Operations
int	internal
IPA	integrated plant assessment
ISG	Interim Staff Guidance
ISI	inservice inspection
ksi	kilo-pounds per square inch
KV or kV	kilo-volt

Abbreviation or Acronym	**Description**
LAS	low alloy steel
LLRT	local leakage rate test
LOCA	loss of coolant accident
LPSI	low pressure safety injection system
LR	license renewal
LRA	license renewal application
LREH	License Renewal Electrical Handbook
LRT	leak rate testing
MB	missile barrier
MEB	metal enclosed bus
MeV	million electron-volts
MIC	microbiologically induced corrosion
MS	main steam; Mississippi
MSIV	main steam isolation valve
MSL	mean sea level
MSLB	main steam line break
MWe	megawatts-electrical
MWt	megawatts-thermal
NA	neutron absorption; not applicable
n/cm^2	neutrons per square centimeter
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NG	nitrogen
Ni	nickel
NPIS	nuclear plant island structure
NPS	nominal pipe size

Abbreviation or Acronym	**Description**
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
OBE	operating basis earthquake
OE	operating experience
OVHLL	Overhead Heavy Load and Light Load
PB	pressure boundary
PCSR	permanent cavity seal ring
pH	potential of hydrogen
PH	precipitation-hardened
PM	preventive maintenance
PMP	probable maximum precipitation
PMU	primary makeup
PRM	process radiation monitoring
PSL	primary sampling
PSPM	periodic surveillance and preventive maintenance
P-T	pressure-temperature
PVC	polyvinyl chloride
PW	potable water
PWR	pressurized water reactor
PWST	primary water storage tank
QA	quality assurance
RAB	reactor auxiliary building
RC	reactor coolant
RCC	reactor cavity cooling
RCP	reactor coolant pump

Abbreviation or Acronym	Description
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	Regulatory Guide
RPV	reactor pressure vessel (synonymous with reactor vessel)
RT_{NDT}	reference temperature (nil-ductility transition)
RWSP	refueling water storage pool
SA	service air
S&PC	steam and power conversion
SBO	station blackout
SBV	shield building ventilation
SCBA	self-contained breathing apparatus
SCC	supplementary chiller condensing; stress corrosion cracking
SE	Safety Evaluation
SER	Significant Event Report
SG	steam generator
SI	safety injection
SIS	safety injection system
SIT	safety injection tank
SNS	support for Criterion (a)(2) equipment
SO_2	sulfur dioxide
SP	sump pump
SRE	support for Criterion (a)(3) equipment
SRP	[NUREG-1800, License Renewal] Standard Review Plan
SS	site security; stainless steel
SSC	system, structure, or component
SSR	support for Criterion (a)(1) equipment
STAMR	subject to aging management review
SVS	cable vault and switchgear ventilation

Abbreviation or Acronym	Description
TC	turbine building cooling water
TGB	turbine generator building
TLAA, TLAAs	time-limited aging analysis, time-limited aging analyses
TRM	Technical Requirements Manual
TSP	trisodium phosphate dodecahydrate
TW	treated water
USE	upper-shelf energy
V	volt
yr	year
Zn	zinc
¼T	one-fourth of the way through the vessel wall measured from the internal surface of the vessel

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1.0 ADMINISTRATIVE INFORMATION

Pursuant to Part 54 of Title 10 of the Code of Federal Regulations (10 CFR Part 54), this application seeks renewal for an additional 20-year term of the facility operating license for Waterford Steam Electric Station, Unit 3 (Waterford 3). The facility operating license for Waterford 3 (Docket Number 50-382, License Number NPF-38) expires at midnight on December 18, 2024. The application also applies to renewal of those Nuclear Regulatory Commission (NRC) source material, special nuclear material, and by-product material licenses that are subsumed or combined with the facility operating license.

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

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 in support of the issuance of a renewed facility operating license for Waterford 3.

1.1 GENERAL INFORMATION

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

1.1.1 <u>Name of Applicant</u>

Entergy Operations, Inc.

Entergy Louisiana, LLC

1.1.2 <u>Address of Applicant</u>

Entergy Operations, Inc.
1340 Echelon Parkway
Jackson, Mississippi 39213

Entergy Louisiana, LLC
4809 Jefferson Highway
Jefferson, Louisiana 70121

Address of Nuclear Facility

Waterford Steam Electric Station, Unit 3
Entergy Operations, Inc.
17265 River Road
Killona, Louisiana 70057-3093

1.1.3 Description of Business of Applicants

Entergy Louisiana, LLC, is the owner of Waterford 3, located in St. Charles Parish, Louisiana. Entergy Operations, Inc. (EOI) is the licensed operator of Waterford 3. Entergy Louisiana, LLC, and EOI (hereafter referred to as Entergy) are the holders of Waterford 3 operating license NPF-38 and for purposes of this application are considered the applicant.

Entergy Utility Holding Company, LLC, a Texas limited liability company, is an intermediary holding company for Entergy Corporation and the direct parent company of Entergy Louisiana, LLC. Entergy Louisiana, LLC, is one of Entergy Corporation's five retail electric utility subsidiaries. These companies generate, transmit, distribute and sell electric power to retail and wholesale customers in Arkansas, Louisiana, Mississippi, and Texas.

EOI is engaged principally in the business of operating nuclear power facilities.

Entergy Corporation is an integrated energy company engaged primarily in electric power production and retail distribution operations.

1.1.4 Legal Status and Organization

EOI, a Delaware limited liability company, is a wholly owned subsidiary of Entergy Corporation. The principal office is located in Jackson, Mississippi. EOI is not owned, controlled or dominated by an alien, a foreign corporation, or foreign government.

The names and addresses for EOI directors and principal officers are listed below. All are U.S. citizens.

Timothy G. Mitchell Director President and Chief Executive Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Donna Jacobs Director Chief Operating Officer–South	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213

William F. Maguire Director Vice President, Operations Support	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Marcus V. Brown Executive Vice President and General Counsel	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Jeremy G. Browning Vice President, Operations (Arkansas Nuclear One)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Michael R. Chisum Vice President, Operations (Waterford 3)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Vincent Fallacara Vice President, Operations Support	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
William J. James, Jr. Vice President, Major Fleet Projects	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Steven C. McNeal Vice President and Treasurer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Kevin J. Mulligan Vice President, Operations (Grand Gulf Nuclear Station	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Eric W. Olson Vice President, Site (River Bend Station)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213

Entergy Louisiana, LLC is the owner of Waterford 3. As discussed in Section 1.1.3, Entergy Utility Holding Company, LLC is the direct parent company of Entergy Louisiana, LLC. The principal office of Entergy Louisiana, LLC is located in Jefferson, Louisiana. Entergy Louisiana, LLC is not owned, controlled or dominated by an alien, a foreign corporation, or foreign government.

The names and addresses for Entergy Louisiana, LLC, directors and principal officers are listed below. All are U.S. citizens.

Phillip R. May Director and Chairman of the Board President and Chief Executive Officer	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Theodore H. Bunting, Jr. Director Group President, Utility Operations	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Paul D. Hinnenkamp Director	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Andrew S. Marsh Director Executive Vice President and Chief Financial Officer	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Marcus V. Brown Executive Vice President and General Counsel	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Joseph T. Henderson Senior Vice President and General Tax Counsel	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Timothy G. Mitchell Senior Vice President and Chief Nuclear Officer	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Alyson M. Mount Senior Vice President and Chief Accounting Officer	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Dennis P. Dawsey Vice President, Customer Service	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
John P. Hurstell Vice President, System Planning	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121

Mark D. Kleehammer Vice President, Regulatory and Public Affairs	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Steven C. McNeal Vice President and Treasurer	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121
Jody Montelaro Vice President, Public Affairs	Entergy Louisiana, LLC 4809 Jefferson Highway Jefferson, LA 70121

1.1.5 Class and Period of License Sought

The applicant requests renewal of the facility operating license for Waterford 3 (facility operating license Docket Number 50-382, License Number NPF-38) for a period of 20 years. The license was issued under Section 103 of the Atomic Energy Act of 1954 as amended. License renewal would extend the Waterford 3 facility operating license from midnight, December 18, 2024, to midnight, December 18, 2044.

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

1.1.6 Alteration Schedule

Entergy does not propose to construct or alter any production or utilization facility in connection with this renewal application.

1.1.7 Regulatory Agencies with Jurisdiction

Regulatory agencies with jurisdiction over the station are listed below.

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

Department of Environmental Quality (DEQ)
P.O. Box 4313
Baton Rouge, Louisiana 70821-4313

Louisiana Public Service Commission
P.O. Box 91154
Baton Rouge, Louisiana 70821-9154

Parish President Council
St. Charles Parish
P.O. Box 302
Hahnville, Louisiana 70057

1.1.8 Local News Publications

St. Charles Parish Herald Guide
14236 U.S. 90
Boutte, LA 70039

The Times-Picayune
365 Canal St.
New Orleans, LA 70130

The New Orleans Advocate
1010 Common Street
Suite 3030
New Orleans, LA 70112

1.1.9 Conforming Changes to Standard Indemnity Agreement

10 CFR 54.19(b) requires that license renewal applications include “conforming changes to the standard indemnity agreement, 10 CFR 140.92, Appendix B, to account for the expiration term of the proposed renewed license.” The current Indemnity Agreement (No. B-92) for Waterford Steam Electric Station, Unit 3, states in Article VII that the Agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment (to the Agreement), which is the last to expire. Item 3 of the Attachment to the Indemnity Agreement, as revised through Amendment No. 7, lists Waterford 3 facility operating license number NPF-38. Entergy has reviewed the original Indemnity Agreement and the Amendments. Neither Article VII nor Item 3 of the Attachment specifies an expiration date for license number NPF-38. Therefore, no changes to the Indemnity Agreement are deemed necessary as part of this application. Should the license number be changed by NRC upon issuance of the renewed license, Entergy requests that NRC amend the Indemnity Agreement to include conforming changes to Item 3 of the Attachment and other affected sections of the Agreement.

1.1.10 Restricted Data Agreement

This application does not contain restricted data or national security information, and the applicant does not expect that any activity under the renewed license for Waterford 3 will involve such information. However, if such information were to become involved, the applicant agrees to secure such information appropriately and not to permit any individual to have access to, or any facility to possess, such information until the individual or facility has been approved under the provisions of 10 CFR Parts 25 or 95, respectively.

1.2 PLANT DESCRIPTION

The Waterford 3 site is located on the west (right descending) bank of the Mississippi River near Taft, Louisiana, in the northwest portion of St. Charles Parish. About 3 miles westward is the eastern boundary of St. John the Baptist Parish. The coordinates for the reactor are 29º 59' 42" north latitude and 90º 28' 16" west longitude. Kenner, the nearest population center, is 13 miles east of the site. Approximately 25 miles east-southeast of the site is the city of New Orleans, and approximately 50 miles north-northwest is the city of Baton Rouge. The exclusion radius is taken as 915 meters, and the low population zone is a 2-mile radius.

The Nuclear Steam Supply System (NSSS) is a pressurized water reactor designed by Combustion Engineering, Incorporated. The containment structure, designed by Ebasco Services Incorporated, is comprised of a steel containment vessel surrounded by a reinforced concrete shield building.

WF3 is a pressurized-water reactor plant of the Combustion Engineering design. Since March 1985, WF3 has had two increases in reactor core power level, which has resulted in an increase in design net electrical output from 1,104 megawatts electric (MWe) to 1,188 MWe. The first reactor core power level increase from 3,390 megawatts thermal (MWt) to 3,441 MWt occurred in March 2002 and resulted in an increase in design net electrical output of approximately 16 MWe. The second reactor core power level increase from 3,441 MWt to 3,716 MWt, starting with Operating Cycle 14, resulted in another increase in design net electrical output of approximately 68 MWe.

The principal structure at the site is the Nuclear Plant Island Structure (NPIS), which is a reinforced concrete box structure with solid exterior walls. All safety-related components are housed in the NPIS, which is flood protected up to El. +29.27 ft. mean sea level (MSL) (see Section 2.1.1.1 for further information). The NPIS provides a common structure for the reactor building, reactor auxiliary building (which includes the control room), fuel handling building, and component cooling water system structures (cooling tower areas), as well as a common foundation mat for support of these structures.

Main structures outside the NPIS are the turbine building, water treatment building, condensate polisher building, fire pump house, radioactive material storage building, chiller building, service building, administration building, maintenance support building, and intake and discharge structures, as well as the independent spent fuel storage installation (ISFSI) and various nonsafety-related storage tanks (fuel oil, fire water, demineralized water, condensate, and primary water).

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

This chapter describes the process for identification of structures and components subject to aging management review (AMR) in the Waterford 3 integrated plant assessment (IPA). For those systems, structures, and components (SSCs) within the scope of license renewal, 10 CFR 54.21(a)(1) requires the license renewal applicant to identify and list structures and components subject to AMR. Furthermore, 10 CFR 54.21(a)(2) requires that methods used to identify these structures and components be described and justified. Technical information in this section serves to satisfy these requirements.

The scoping and screening method is described in Section 2.1. This method is implemented in accordance with NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 – The License Renewal Rule*, Revision 6, June 2005. The results of the assessment to identify the systems and structures within the scope of license renewal (plant level scoping) are in Section 2.2. The results of the identification of the components and structural components subject to aging management review (screening) are in Section 2.3 for mechanical systems, Section 2.4 for structures, and Section 2.5 for electrical and instrumentation and control (I&C) systems.

Table 2.0-1 gives the definitions of component intended functions used in this application for components and structural components. Tables in the application may refer to either the intended function name or to the abbreviation.

The term "piping" in component lists includes pipe and pipe fittings (such as elbows, flued heads and reducers).

Table 2.0-1
Component Intended Functions: Abbreviations and Definitions

Abbreviation	Intended Function	Definition
CE	Conducts electricity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals.
EN	Enclosure protection	Provides enclosure, shelter or protection for in-scope equipment (including high-energy line break [HELB], radiation shielding, pipe whip restraint, and thermal shielding).
FB	Fire barrier	Provide rated fire barrier to confine or retard a fire from spreading between adjacent areas.
FC	Flow control	Provide control of flow rate or establish a pattern of spray.
FD	Flow distribution	Provide distribution of flow.
FLB	Flood barrier	Provide flood protection barrier for internal or external flooding events.
FLT	Filtration	Provide removal of unwanted material.
HS	Heat sink	Provide heat sink during station blackout (SBO) or design basis accidents (includes source of cooling water for plant shutdown).
HT	Heat transfer	Provide ability to transfer heat.
IN	Insulation	Insulate and support an electrical conductor (electrical) or provide insulating characteristics to reduce heat transfer (structural).
MB	Missile barrier	Provide barrier against internally or externally generated missile.
NA	Neutron absorption	Absorb neutrons.
PB	Pressure boundary	Provide pressure boundary integrity such that adequate flow and pressure can be delivered or provide fission product barrier for containment pressure boundary. This function includes maintaining structural integrity and preventing leakage or spray for 10 CFR 54.4(a)(2) (mechanical). Provide pressure boundary or essentially leak-tight barrier (structural).

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

Abbreviation	Intended Function	Definition
SNS	Support for Criterion (a)(2) equipment	Provide structural or functional support to nonsafety-related equipment whose failure could prevent satisfactory accomplishment of required safety functions (includes II/I considerations) [10 CFR 54.4(a)(2)].
SRE	Support for Criterion (a)(3) equipment	Provide structural or functional support to equipment required to meet the Commission’s regulations for any of the five regulated events in 10 CFR 54.4(a)(3).
SSR	Support for Criterion (a)(1) equipment	Provide structural or functional support for safety-related equipment.
STR	Structural integrity	Maintain structural integrity of reactor vessel internals components such that loose parts are not introduced into the system.
STRSP	Structural support	Provide structural or functional support for reactor coolant system components.

2.1 SCOPING AND SCREENING METHODOLOGY

2.1.1 Scoping Methodology

The license renewal rule, 10 CFR 54 (Ref. 2.1-1), defines the scope of license renewal. Section 54.4(a) requires systems, structures, and components (SSCs) to be included in the license renewal process if they are—

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

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

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

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

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

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

NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule* (Ref. 2.1-8), provides industry guidance for determining what SSCs are within the scope of license renewal. The process used to determine the systems and structures within the scope of license renewal for Waterford 3 followed the recommendations of NEI 95-10.

Consistent with NEI 95-10, the scoping process developed a list of plant systems and structures and identified their intended functions. Intended functions are those functions that are the basis for including a system or structure within the scope of license renewal (as defined in 10 CFR 54.4(b)) and are identified by comparing the system or structure function with the criteria in 10 CFR 54.4(a).

The Waterford 3 equipment database was used to identify the system codes in use at the plant. The equipment database is a controlled list of plant components, with each component assigned to one plant system code. The list of plant systems for license renewal scoping was then developed based on the plant system codes, flow diagrams, and system functions as identified in maintenance rule scoping documents and design basis documents. Systems described in the FSAR do not necessarily correspond to equipment database system codes or the system names used for license renewal. The system descriptions in Section 2.3 explain as needed how the system names relate to system descriptions in the FSAR.

For mechanical system scoping, a system is defined as the collection of components required to perform the system's functions. These components are identified in the equipment database, on flow diagrams, and in descriptions of the systems in maintenance rule scoping documents, design basis documents, and system training material. While structural commodities, such as supports, are included in the equipment database and assigned system codes, these components are evaluated with the structural bulk commodities.

Component numbers on flow diagrams do not always correlate with component identifications in the equipment database. On some flow diagrams, the original Ebasco component identification numbers are used. Other diagrams show the Entergy component identification that is used in Entergy's Asset Suite, which is the software product used by the Entergy operating fleet for work management, document management, engineering changes, etc. Still other diagrams show both component identifications, the Ebasco number and the Entergy number.

For the purposes of system level scoping, plant electrical and I&C systems as well as electrical and I&C components in mechanical systems are included within the scope of license renewal. Intended functions for electrical and I&C systems are not identified since this bounding scoping approach (i.e., all electrical and I&C components are included in scope by default) makes it unnecessary to determine if an electrical and I&C system has an intended function. Switchyard equipment, which is not part of the plant’s electrical and I&C systems, was reviewed for station blackout (SBO) intended functions based on NRC guidance. For further discussion of Waterford 3 scoping for SBO, see Section 2.1.1.3.5. See Section 2.5 for additional information on electrical and I&C scoping.

As the starting point for structural scoping, a list of plant structures was developed from a review of plant layout drawings, the FSAR, maintenance rule documentation, and relevant design basis documents. The structures list includes structures that potentially support plant operations or could adversely impact structures that support plant operations (i.e., seismic II/I). In addition to buildings and facilities, the list of structures includes other structures that support plant operation (e.g., electrical manholes and foundations for freestanding tanks). See Section 2.4 for the results of structural scoping.

Intended functions for structures and mechanical systems were identified based on reviews of applicable plant licensing and design documentation. Documents reviewed included the FSAR, design basis documents, maintenance rule scoping documents, the post-fire safe shutdown analysis, and, as necessary, system training materials and various station drawings.

Each mechanical system and structure function was evaluated against the criteria of 10 CFR 54.4 as described in the following sections. Section 2.1.1.1 discusses the evaluation of the safety-related criteria in 10 CFR 54.4(a)(1). Section 2.1.1.2 discusses the evaluation of the criteria of 10 CFR 54.4(a)(2). Section 2.1.1.3 discusses the evaluation of the criteria in 10 CFR 54.4(a)(3). The results of these evaluations for plant system and structures are presented in Section 2.2.

2.1.1.1 Application of Safety-Related Scoping Criteria

A system or structure is within the scope of license renewal if it performs a safety function during and following a design basis event as defined in 10 CFR 54.4(a)(1). Design basis events are defined in 10 CFR 50.49(b)(1)(ii) as conditions of normal operation, including anticipated operational occurrences, design basis accidents, external events, and natural phenomena for which the plant must be designed to ensure functions identified in 10 CFR 54.4(a)(1)(i) through (iii).

An Entergy corporate procedure and a site engineering standard provide control of component and structure quality classification. The procedures define design basis events consistent with 10 CFR 50.49 (b)(1) and define the quality assurance classification of “safety-related” as follows:

> Those structures, systems and components that are relied upon to remain functional during and following design basis events to assure:
>
> (1) The integrity of the reactor coolant pressure boundary.
>
> (2) The capability to shut down the reactor and maintain it in a safe shutdown condition.
>
> (3) The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1), 10 CFR 50.67, or 10 CFR 100.11.

This is the same definition used for safety-related SSC used in 10 CFR 54.4(a)(1), with a slight difference in wording: where Entergy procedures use "the applicable guideline exposures set forth in….," 10 CFR 54.4(a)(1)(iii) uses the phrase, "those referred to in…." The two phrases are equivalent. The original specifications for Waterford 3 used a somewhat different definition for Safety Class 3 for equipment whose failure would "result in significant release of radioactivity to the environment." Use of the term "significant release" instead of the requirements of 50.34(a)(1), 50.67(b)(2), or 100.11 resulted in components that are classified as Safety Class 3 at Waterford 3 but do not meet the criteria of 10 CFR 54.4(a)(1). Waterford 3 Safety Class 3 components were evaluated to determine if they supported system functions meeting the requirements of 10 CFR 54.4(a)(1). Those that did not were further evaluated for the criteria of 10 CFR 54.4(a)(2) and (a)(3).

The Waterford 3 equipment database maintains the controlled component level list of quality classifications.

Mechanical system safety functions were obtained from the FSAR, maintenance rule scoping documents, and design criteria documents. Mechanical systems whose only safety-related components are electrical and I&C components or structural components are not included in scope for this criterion; however, the electrical and I&C portions of the system are included in scope by default, and structural components are included in the structural evaluations.

Structural safety functions include providing containment or isolation to mitigate post-accident off-site doses and providing support or protection to safety-related equipment. Structures with safety functions are identified in the maintenance rule scoping documents. All structures with a safety function or that support or protect a safety-related component are included within the scope of license renewal on the basis of 10 CFR 54.4(a)(1). Structures and structural components that provide protection to safety-related equipment from external events and natural phenomena are included in the scope of license renewal on the basis of 10 CFR 54.4(a)(1).

As described in Section 2.1.1, plant electrical and I&C systems are included in the scope of license renewal by default.

At Waterford 3, all safety-related equipment is housed within the nuclear plant island structure (NPIS). The NPIS is a reinforced concrete box structure with solid exterior walls that provide flood protection up to El. +29.27 feet MSL. The NPIS is the common structure of the reactor building, reactor auxiliary building, fuel handling building, and component cooling water system structure. All exterior doors and penetrations below +29.27 feet MSL that lead to areas containing safety-related equipment are watertight.

The original design flood level of the NPIS was El. 30.0 ft. MSL. During the initial phase of construction from 1975 to 1978, the plant settled approximately 9 inches. Therefore, the established elevations of the plant on design drawings are higher by approximately 9 inches than the actual elevations. The top of the exterior walls (flood walls) of the NPIS were surveyed in 1991 to be at El. 29.27 ft. MSL. The design flood level of the NPIS is reduced to El. 29.25 ft. MSL from El. 30.0 ft. MSL, a 9-inch difference. The safety-related equipment housed within the NPIS is still protected from disastrous floods since the highest level the water will reach at the NPIS is El. 27.6 ft. MSL in the most severe conditions. Several site documents (including the FSAR and descriptions in this application) still use the original design flood level of +30 feet MSL, without correction for the 9-inch discrepancy.

2.1.1.2 Application of Criterion for Nonsafety-Related SSCs Whose Failure Could Prevent the Accomplishment of Safety Functions

This review identified nonsafety-related systems and structures containing components whose failure could prevent satisfactory accomplishment of a safety function. The guidance of NEI 95-10 Appendix F is used to define the SSCs included in scope for physical interaction. Consideration of hypothetical failures that could result from system interdependencies that are not part of the current licensing basis and that have not been previously experienced is not required.

The impact of nonsafety-related SSC failures on safety functions can be either functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of a nonsafety-related SSC in physical proximity to a safety-related SSC.

2.1.1.2.1 Functional Failures of Nonsafety-Related SSCs

At Waterford 3, with few exceptions, systems and structures required to perform a function to support a safety function are classified as safety-related and have been included in the scope of license renewal per Section 2.1.1.1. For the few exceptions where nonsafety-related equipment is required to remain functional to support a safety function (e.g., the dry cooling tower sump pumps, makeup to spent fuel pool), the system containing the equipment has been included in scope, and the function is listed as an intended function for 10 CFR 54.4(a)(2) for the system.

Flooding analyses were reviewed to determine systems with functions credited to mitigate effects of external or internal flooding.

2.1.1.2.2 Physical Failures of Nonsafety-Related SSCs

Some nonsafety-related components could affect safety-related components due to their physical proximity; that is, their physical location can result in interaction between the components should the nonsafety-related component fail. Based on the license renewal rule and the guidance in NEI 95-10 (Ref. 2.1-8), physical failures of nonsafety-related SSCs in scope based on 10 CFR 54.4(a)(2) fit into the following two categories.

(1) Nonsafety-Related SSCs Directly Connected to Safety-Related SSCs

For nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems), components within the scope of license renewal include the nonsafety-related piping, components and supports up to and including the first seismic or equivalent anchor or base-mounted component beyond the safety-to-nonsafety interface such that the safety-related portion of the piping will be able to perform its intended function. See Section 2.1.2.1.2 for further discussion of screening these components.

(2) Nonsafety-Related SSCs with the Potential for Spatial Interaction with Safety-Related SSCs

Spatial interactions can occur as (a) physical impact or flooding; (b) pipe whip, jet impingement, or harsh environments (such as caused by a HELB); or (c) leakage or spray.

(a) Physical Impact or Flooding

This category concerns potential spatial interaction of nonsafety-related SSCs falling on or otherwise physically impacting safety-related SSCs (e.g., by causing flooding) such that safety functions may not be accomplished.

Structural components that meet the criterion of 10 CFR 54.4(a)(2) include missile barriers, flood barriers, HELB protection, and nonsafety-related supports for non-seismic (including seismic II/I) piping systems and electrical conduit and cable trays with potential for spatial interaction with safety-related equipment. This also includes seismic Category I supports provided for nonsafety-related components, such as ducting. Structural components that protect safety-related equipment are within the scope of license renewal and are evaluated in the structural aging management review for the structure in which they are located or in the bulk commodities aging management review (Section 2.4).

(b) Pipe Whip, Jet Impingement, or Harsh Environments

Nonsafety-related portions of high-energy lines were evaluated against the criterion of 10 CFR 54.4(a)(2). Documents reviewed included the FSAR and other relevant site documentation. High-energy systems were evaluated to ensure identification of components that are part of nonsafety-related high-energy lines that can affect safety-related equipment.

If a HELB analysis assumes that a nonsafety-related piping system does not fail or assumes failure only at specific locations, then that piping system is within the scope of license renewal per 10 CFR 54.4(a)(2) and subject to aging management review in order to provide reasonable assurance that those assumptions remain valid through the period of extended operation.

(c) Leakage or Spray

Moderate- and low-energy systems have the potential for spatial interactions of leakage or spray. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for leakage or spray that could prevent safety-related SSCs from performing their required safety function are in the scope of license renewal and subject to aging management review.

Operating experience indicates that nonsafety-related components containing only air or gas have experienced no failures due to aging that could impact the ability of safety-related equipment to perform required safety functions. There are no aging effects for these components when the environment is a dry gas. Therefore, a system containing only air or gas is not in the scope of license renewal based on the potential for spray or leakage.

The review used a spaces approach for scoping of nonsafety-related systems with potential spatial interaction with safety-related SSCs. The spaces approach focuses on the interaction between nonsafety-related and safety-related SSCs that are located in the same space. A "space" is defined as a room or cubicle that is separated from other spaces by substantial objects (such as wall, floors, and ceilings). The space is defined such that any potential interaction between nonsafety-related and safety-related SSCs, including flooding, is limited to the space.

Nonsafety-related systems that contain water, oil, or steam with components located inside structures containing safety-related SSCs are potentially in scope for possible spatial interaction under criterion 10 CFR 54.4(a)(2). These systems were evaluated further to determine if system components were located in a space such that safety-related equipment could be affected by a component failure.

Equipment that has been retired in place and is no longer functional was included in this evaluation. The retired equipment was evaluated for potential spatial interaction.

As described in Section 2.1.1, plant electrical and I&C systems are included in the scope of license renewal by default.

2.1.1.3 Application of Criterion for Regulated Events

The scope of license renewal includes those systems, structures, and components relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48), environmental qualification (10 CFR 50.49), pressurized thermal shock (10 CFR 50.61), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63). This section discusses the approach used to identify the systems and structures within the scope of license renewal based on this criterion. The systems and structures that perform intended functions in support of these regulated events are identified in the descriptions in Sections 2.3, 2.4, and 2.5.

2.1.1.3.1 Commission's Regulations for Fire Protection (10 CFR 50.48)

On July 16, 2004, the NRC amended 10 CFR 50.48 to add a new subsection, 10 CFR 50.48(c), that established acceptable fire protection requirements. The change to 10 CFR 50.48 endorses with exceptions the National Fire Protection Association's (NFPA) Standard 805, *Performance-Based Standard for Fire Protection for Light Water Reactor Electric Generating Plants,* 2001 Edition, as a voluntary alternative for demonstrating compliance with 10 CFR 50.48 Sections (b) and (f). Waterford 3 is in the process of transitioning to the NFPA 805 risk-informed, performance-based fire protection program. However, as this process has not been completed, this license renewal application is based on the site's requirements under 10 CFR 50.48 and Appendix R.

Systems and structures in the scope of license renewal for fire protection include those required for compliance with 10 CFR 50.48 and Appendix R. Equipment relied on for fire protection includes SSCs credited with fire prevention, detection, and mitigation in areas containing equipment important to safe operation of the plant as well as systems that contain plant components credited for safe shutdown following a fire. To identify this equipment, Waterford 3 fire protection documents were reviewed.

FSAR Section 9.5 describes the fire protection program and fire protection systems for the current licensing basis, including a detailed comparison to Appendix A of the Branch Technical Position APCSB 9.5-1, Rev. 0. Section 9.5.1.3.2 provides a fire area-by-fire area analysis of the fire hazards in each area, including a listing of equipment located in the fire area/zone which may be used to achieve and maintain safe shutdown following a fire elsewhere in the plant and a description of measures provided for fire control.

The Waterford 3 post-fire safe shutdown analysis is documented in a site calculation. This calculation was performed in the context of the post-fire safe shutdown system separation requirements defined by Branch Technical Position (BTP) CMEB 9.5.1 and 10 CFR 50, Appendix R, and demonstrates compliance with Section III.G and III.L of Appendix R to 10 CFR 50. The calculation also incorporates analyses performed in preparation for the transition to NFPA 805.

A site administrative procedure describes responsibilities, controls and implementing requirements for the Waterford 3 Fire Protection Program. The Fire Protection Program assures that a defense-in-depth program is provided to (1) prevent fires from starting, (2) detect rapidly, control, and extinguish fires that do occur, and (3) provide protection for structures, systems and components important to safety so that a fire that is not promptly extinguished by the fire suppression activities will not prevent the safe shutdown of the plant.

Based on the review of the Waterford 3 current licensing bases for fire protection, the system intended functions performed in support of the fire protection program requirements were determined. Section 2.3 contains the results of the review for the Waterford 3 mechanical systems and identifies systems that contain passive mechanical components that are required for fire protection and safe shutdown of the plant.

Structures required to provide support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.48 are considered to be within the scope of license renewal based on 10 CFR 54.4(a)(3). Structural commodities credited as fire barriers are included in the structural aging management reviews. Section 2.4 contains the results of the scoping review for the Waterford 3 structures.

As described in Section 2.1.1, plant electrical and I&C systems are included in the scope of license renewal by default.

2.1.1.3.2 Commission's Regulations for Environmental Qualification (10 CFR 50.49)

Electric equipment important to safety that is required to be environmentally qualified to mitigate certain accidents that result in harsh environmental conditions in the plant is defined in 10 CFR 50.49. The Waterford 3 Environmental Qualification Program controls the maintenance of the EQ Component List (EQCL), which is contained within the equipment database. The EQCL identifies electrical equipment and components that are required to function during and subsequent to design basis events.

As described in Section 2.1.1, plant electrical and I&C systems are included in the scope of license renewal by default. This includes equipment relied upon to perform a function that demonstrates compliance with the Commission’s regulations for environmental qualification.

2.1.1.3.3 Commission's Regulations for Pressurized Thermal Shock (10 CFR 50.61)

The pressurized thermal shock (PTS) rule, 10 CFR 50.61, “Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events,” requires that licensees of pressurized water reactors evaluate the reactor vessel beltline materials against specific criteria to ensure protection from brittle fracture. 10 CFR 50.61 specifies the calculation method to determine an analytical reference temperature, RT_{PTS}, which is compared to PTS screening criteria specified in the rule.

RT_{PTS} values have been extrapolated through the period of extended operation, or 55 effective full power years (EFPY). The limiting reference temperature after 60 years of operation is below the screening criteria. As a result, no flux reduction programs or modifications to equipment, systems or operation are necessary to prevent potential failure of the reactor vessel.

The only system currently relied upon to meet the PTS regulation is the reactor coolant system, which contains the reactor vessel. There are no electrical systems or structures relied upon to meet the PTS regulation. For further information on PTS evaluation, see Section 4.2.3.

2.1.1.3.4 Commission's Regulations for Anticipated Transients without Scram (10 CFR 50.62)

An anticipated transient without scram (ATWS) is an anticipated operational occurrence that is accompanied by a failure of the reactor trip system to shut down the reactor. The ATWS rule, 10 CFR 50.62, requires specific improvements in the design and operation of commercial nuclear power facilities to reduce the probability of failure to shut down the reactor following anticipated transients and to mitigate the consequences of an ATWS event.

FSAR Section 7.8 describes the ATWS mitigation systems. The ATWS mitigation systems are designed to mitigate the consequences of anticipated operational occurrence (AOO's) such as a loss of feedwater, loss of condenser vacuum, or loss of offsite power coupled with a failure of the reactor protection system to trip the reactor.

The ATWS mitigation systems are comprised of two essentially independent subsystems: the Diverse Reactor Trip System (DRTS) and the Diverse Emergency Feedwater Actuation System (DEFAS). DRTS has the function of tripping the reactor, and DEFAS has the function of initiating emergency feedwater (EFW) to the steam generators when required by an ATWS condition.

Inherent to DRTS design is a turbine trip independent and diverse from the plant protection system, which is initiated by undervoltage conditions sensed in the control element assembly (CEA) drive control system. This arrangement, which is the diverse turbine trip system in FSAR Section 7.8, satisfies the ATWS rule requirements for a diverse turbine trip.

Based on Waterford 3 current licensing bases for ATWS, system intended functions performed in support of ATWS requirements were determined. System scoping evaluations in Section 2.3 contain the results of the review for Waterford 3 systems. There are no mechanical systems with an intended function in support of ATWS requirements.

The structure scoping evaluations in Section 2.4 contain the results of the review for the Waterford 3 structural systems. Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.62 are considered to be within the scope of license renewal based on 10 CFR 54.4(a)(3).

As described in Section 2.1.1, plant electrical and I&C systems are included in the scope of license renewal by default. Consequently, electrical and I&C equipment that supports the requirements of 10 CFR 50.62 is included in the scope of license renewal.

2.1.1.3.5 Commission's Regulations for Station Blackout (10 CFR 50.63)

10 CFR 50.63, "Loss of All Alternating Current Power," requires that each light-water-cooled nuclear power plant be able to withstand and recover from an SBO. As defined by 10 CFR 50.2, an SBO is the loss of offsite power and on-site emergency alternating current (AC) electric power to the essential and non-essential switchgear buses in a nuclear power plant. It does not include the loss of AC power fed from inverters powered by station batteries or by alternate AC sources,

nor does it assume a concurrent single failure or design basis accident. The objective of this requirement is to assure that nuclear power plants are capable of withstanding an SBO and maintaining adequate reactor core cooling and appropriate containment integrity for a required duration.

FSAR Appendix 8.1A summarizes the licensing bases for SBO at Waterford 3. Waterford 3 has developed a four-hour coping analysis to address the requirements of 10 CFR 50.63. Based on the current licensing bases for SBO, system intended functions performed in support of 10 CFR 50.63 requirements were determined. System scoping evaluations in Section 2.3 contain the results of the review for Waterford 3 systems.

Based on NRC guidance in NUREG-1800, Section 2.5.2.1.1 (Ref. 2.1-2), certain switchyard components required to restore offsite power are conservatively included within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for SBO (10 CFR 50.63).

The individual structure scoping evaluations in Section 2.4 contain the results of the review for the Waterford 3 structural systems. Structures providing support, shelter or protection to equipment meeting the criterion of 10 CFR 54.4(a)(3) based on the requirements of 10 CFR 50.63 or the restoration of offsite power are considered to be within the scope of license renewal based on 10 CFR 54.4(a)(3).

As described in Section 2.1.1, plant electrical and I&C are included in the scope of license renewal by default. Consequently, electrical equipment that supports the requirements of 10 CFR 50.63 is included in the scope of license renewal. Section 2.5 contains the results of the review for electrical and I&C systems.

2.1.2 Screening Methodology

Screening is the process for determining which components and structural elements require aging management review. Screening is governed by 10 CFR 54.21(a), which reads as follows:

> (1) For those systems, structures, and components within the scope of this part, as delineated in § 54.4, identify and list those structures and components subject to an aging management review. Structures and components subject to an aging management review shall encompass those structures and components—
>
> (i) That perform an intended function, as described in § 54.4, without moving parts or without a change in configuration or properties [i.e., passive components]. These structures and components include, but are not limited to, the reactor vessel, the reactor coolant system pressure boundary, steam generators, the pressurizer, piping, pump casings, valve bodies, the core shroud,

component supports, pressure retaining boundaries, heat exchangers, ventilation ducts, the containment, the containment liner, electrical and mechanical penetrations, equipment hatches, seismic Category I structures, electrical cables and connections, cable trays, and electrical cabinets, excluding, but not limited to, pumps (except casing), valves (except body), motors, diesel generators, air compressors, snubbers, the control rod drive, ventilation dampers, pressure transmitters, pressure indicators, water level indicators, switchgears, cooling fans, transistors, batteries, breakers, relays, switches, power inverters, circuit boards, battery chargers, and power supplies; and

(ii) That are not subject to replacement based on a qualified life or specified time period [i.e., long-lived components].

(2) Describe and justify the methods used in paragraph (a)(1) of this section.

(3) For each structure and component identified in paragraph (a)(1) of this section, demonstrate that the effects of aging will be adequately managed so that the intended function(s) will be maintained consistent with the current licensing basis for the period of extended operation.

NEI 95-10 (Ref. 2.1-8) provides industry guidance for screening structures and components to identify the passive, long-lived structures and components that support an intended function. The screening process for Waterford 3 followed the recommendations of NEI 95-10.

Within the group of systems and structures that are in scope, passive long-lived components or structural elements that perform intended functions require aging management review. Components or structural elements that support an intended function do not require aging management review if they are either active or subject to replacement based on a qualified life.

Although the requirements for the integrated plant assessment are the same for each system and structure, in practice the screening process differed for mechanical systems, electrical systems, and structures. The three separate screening processes are described below.

2.1.2.1 Screening of Mechanical Systems

As required by 10 CFR 54.21(a), the screening process identified those components that are subject to aging management review for each mechanical system within the scope of license renewal. Section 2.3 presents the results for mechanical systems. Mechanical component intended functions are included in Table 2.0-1.

2.1.2.1.1 Identifying Components Subject to Aging Management Review

Within the system, components are subject to aging management review if they perform an intended function without moving parts or a change in configuration or properties and if they are not subject to replacement based on a qualified life or specified time period.

In making the determination that a component performs an intended function without moving parts or a change in configuration or properties, it is not necessary to consider the piece parts of the component. However, in the case of valves, pumps, and housings for fans and dampers, the valve bodies, pump casings, and housings may perform an intended function by maintaining the pressure boundary and may therefore be subject to aging management review.

Replacement programs are based on vendor recommendations, plant experience, or any means that establishes a specific service life, qualified life, or replacement frequency under a controlled program. Components that are subject to replacement based on qualified life or specified time period are not subject to aging management review. Where flexible elastomer hoses/expansion joints or other components are periodically replaced, these components are not subject to aging management review.

Safety-related instrument air solenoid valves that open to relieve pressure and fail to a safe position upon loss of pressure boundary do not require aging management review because maintaining a pressure boundary is not a component intended function for these valves.

2.1.2.1.2 Identifying Components Subject to Aging Management Review Based on Support of an Intended Function for 10 CFR 54.4(a)(2)

As discussed in Section 2.1.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function could impact a safety function. A physical failure is one where a safety function could be impacted by the loss of structural or mechanical integrity of an SSC.

For systems with a function identified as meeting the criteria for 10 CFR 54.4(a)(2) based on a functional failure, components supporting the function are subject to aging management review.

As discussed in Section 2.1.1.2, physical interactions of nonsafety-related systems in scope based on 10 CFR 54.4(a)(2) fit into the following two categories:

- Nonsafety-related systems or components directly connected to safety-related systems (typically piping systems); or
- Nonsafety-related systems or components with the potential for spatial interaction with safety-related SSCs.

Appropriate flow diagrams for the systems were reviewed to identify safety-to-nonsafety interfaces. Piping isometrics were also used to identify seismic anchors and equivalent anchors (restraints or supports) when required to establish scope boundary. For each interface, the boundary was determined by one of the following:

(1) The first seismic anchor, which is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

(2) An equivalent anchor (restraints or supports), which is defined as a boundary point that encompasses at least two supports in each of three orthogonal directions.

(3) A boundary determined using the bounding approach, which included piping beyond the safety-to-nonsafety interface up to a flexible connection or the end of a piping run (such as a vent or drain line) or up to and including a base-mounted component.

(4) An endpoint of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

This is consistent with the guidance in NEI 95-10, Appendix F. All component types required or conservatively considered to provide structural support for safety-related portions of systems are included in aging management reviews.

The following modes of spatial interaction, described in Section 2.1.1.2, were considered in the screening process.

Physical Impact or Flooding

Nonsafety-related supports for non-seismic (including seismic II/I) piping systems and electrical conduit and cable trays with potential for spatial interaction with safety-related structures or components (SCs) are subject to aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a). These supports and components are addressed in a commodity fashion with the structural evaluations in Section 2.4.

Reviews of earthquake experience identified no occurrences of welded steel pipe segments falling due to a strong motion earthquake. Falling of piping segments is extremely rare and only occurs when there is a failure of the supports. This conclusion applies for new and aged pipe. Therefore, as long as the effects of aging on the supports for piping systems are managed, falling of piping sections is not credible except due to flow-accelerated corrosion, and the piping section itself is not in scope for 10 CFR 54.4(a)(2) due to a physical impact hazard (but may be in scope due to the potential for leakage or spray). (Ref. 2.1-8)

Missiles can be generated from internal or external events such as failure of rotating equipment. Nonsafety-related design features that protect safety-related equipment from missiles are subject to aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a). These features are addressed with the structural evaluations in Section 2.4.

Overhead-handling systems (e.g., cranes) whose failure could result in damage to a system that could prevent the accomplishment of a safety function are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2). Specific components in these systems are subject to aging management review. These features are addressed with the structural evaluations for the structure in which the components are located.

Walls, curbs, doors, etc., that provide flood barriers to safety-related equipment are subject to aging management review based on the criteria of 10 CFR 54.4(a)(2) and 54.21(a). These structural components have been included in the evaluation of the building in which they are located or in the evaluation of structural bulk commodities. Structures and structural components are reviewed in Section 2.4.

Pipe Whip, Jet Impingement, or Harsh Environments

To ensure the nonsafety-related portions of high-energy lines were included in the 10 CFR 54.4(a)(2) review, the Waterford 3 FSAR and associated site documentation were reviewed.

Many high-energy lines are safety-related components in systems that are already within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(1). During review of the Waterford 3 systems for 10 CFR 54.4(a)(2), high energy systems were considered. If a HELB analysis assumes that a nonsafety-related piping system does not fail or assumes failure only at specific locations, then that piping system is within the scope of license renewal per 10 CFR 54.4(a)(2). Appropriate components are subject to aging management review to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

Nonsafety-related components in high-energy lines are included in the appropriate system table for the 10 CFR 54.4(a)(2) review (Sections 2.3.1.5, 2.3.2.4, 2.3.3.15 and 2.3.4.5).

Leakage or Spray

Screening nonsafety-related components for a potential impact to safety functions due to leakage or spray is performed using three steps:

1. Determine if the components only contain air or gas.

For these systems, a review of operating experience is performed to confirm that there have been no failures of air/gas systems that could have adversely impacted the ability of equipment to perform required safety functions. The operating experience review performed for WF3 confirmed that there have been no failures of air/gas systems that could have adversely impacted the ability of equipment to perform required safety functions. Based on this review, components containing only air or gas do not have a potential impact to safety functions due to leakage or spray and are therefore not subject to aging management review for 10 CFR 54.4(a)(2) for leakage or spray.

2. Using a "spaces" approach, determine if the system has components in a safety-related structure.

Structures containing safety-related components were identified and systems reviewed to verify the locations of components in the system.

3. Determine if components in safety-related structures have the potential for spatial interaction with a safety-related component from leakage or spray.

For structures that contain safety-related SCs, there may be selected rooms (spaces) that do not contain safety-related components. Nonsafety-related components in such spaces would not have the potential for leakage or spray onto safety-related components. However, no such spaces were identified for WF3.

Therefore, nonsafety-related components containing water, oil, or steam and located in structures containing safety-related equipment were subject to aging management review.

The following structures contain safety-related components.

- Component Cooling Water System Structure (Cooling Tower A and B)
- Fuel Handling Building
- Manholes and duct banks
- Nuclear Plant Island Structure
- Plant Stack
- Reactor Auxiliary Building
- Reactor Building

Abandoned equipment that has not been verified to be isolated and drained that is located in a space with safety-related equipment is included within the scope of license renewal in accordance with 10 CFR 54.4(a)(2). The scope of abandoned equipment was determined from discussions with site personnel and from reviews of the site equipment database and relevant documents, such as design change notices, system and structure scoping results, and piping and instrumentation diagrams that denote abandoned equipment using hash marks and notes.

2.1.2.1.3 Mechanical System Drawings

License renewal drawings were prepared to indicate portions of systems that support system intended functions within the scope of license renewal. Components subject to aging management review (i.e., passive, long-lived components that support system intended functions) are highlighted using color coding to indicate which aging management review evaluated the components.

Flexible elastomer hoses/expansion joints and other components that are periodically replaced and therefore not subject to aging management review are indicated as such on the drawings. Safety-related instrument air solenoid valves that open to relieve pressure and fail to a safe position upon loss of pressure boundary do not require aging management review and thus are not highlighted.

2.1.2.2 Screening of Structures

For each structure within the scope of license renewal, the structural components and commodities were evaluated to determine those subject to aging management review. This evaluation (screening process) for structural components and commodities involved a review of design and licensing basis documents (FSAR, design basis documents, design specifications, site drawings, etc.) to identify specific structural components and commodities that make up the structure. Structural components and commodities subject to aging management review are those that (1) perform an intended function without moving parts or a change in configuration or properties, and (2) are not subject to replacement based on qualified life or specified time period. Section 2.4 presents the results for structures.

2.1.2.2.1 Structural Component and Commodity Groups

Structural components and commodities often have no unique identifiers such as those given to mechanical components. Therefore, grouping structural components and commodities based on materials of construction provided a practical means of categorizing them for aging management reviews. Structural components and commodities were categorized by the following groups based on materials of construction.

- Steel and other metals
- Bolted connections

- Concrete
- Other materials (e.g., fire barrier material, elastomers, wood)

2.1.2.2.2 Evaluation Boundaries

Structural evaluation boundaries were established as described below.

ASME and Non-ASME Component Supports—Mechanical Components

The evaluation boundaries for mechanical component supports were established in accordance with rules governing inspection of component supports (i.e., American Society of Mechanical Engineers (ASME) Section XI, Subsection IWF). Component support examination boundaries for integral and non-integral (i.e., mechanically attached) supports are defined in Article IWF-1300, Figure IWF-1300-1. In general, the support boundary extends to the surface of the building structure, but does not include the building structure. Furthermore, the support boundary extends to include non-integral attachments to piping and equipment, but does not include integral attachments to the same.

Component Supports—Electrical Components

Supports for electrical components include cable trays, conduits, electrical panels, racks, cabinets and other enclosures. The evaluation boundary for these items includes supporting elements, including integral attachments to the building structure.

Other Structural Members

Evaluation boundaries for other structural members whose function is to carry dynamic loads caused by postulated design basis events are consistent with the method for establishing boundaries for supports specified above. That is, the boundary includes the structural component and the associated attachment to the building structure. The portion of the attachment embedded in the building structure is considered part of the structure.

2.1.2.2.3 Intended Functions

Structural components and commodities were evaluated to determine intended functions as they relate to license renewal. NEI 95-10 (Ref. 2.1-8) provides guidelines for determining the intended functions of structures, structural components and commodities.

Structural component and commodity intended functions include providing protection and providing structural or functional support. Many structural components either have the potential for spatial interaction with safety-related equipment (e.g., cranes, hoists) or serve as mitigating features for potential spatial interactions. Mitigating features include missile barriers, flood barriers, HELB protection, and nonsafety-related supports for non-seismic (including seismic II/I) piping systems and electrical conduit and cable trays with potential for spatial interaction with safety-related equipment.

Structural component intended functions are included in Table 2.0-1.

2.1.2.3 Electrical and Instrumentation and Control Systems

The electrical and I&C aging management review evaluates commodity groups containing components with similar characteristics. Screening applied to commodity groups determines which electrical and I&C components are subject to aging management review. An aging management review is required for commodity groups that perform an intended function, as described in 10 CFR 54.4, without moving parts or without a change in configuration or properties (passive) and that are not subject to replacement based on a qualified life or specified time period (long-lived). Section 2.5 presents the results for electrical systems. Electrical and I&C component intended functions are included in Table 2.0-1.

2.1.2.3.1 Passive Screening

NEI 95-10, Appendix B, “Typical Structure, Component and Commodity Groupings and Active/ Passive Determinations for the Integrated Plant Assessment,” identifies electrical commodities considered to be passive. Waterford 3 electrical commodity groups were compared to the NEI 95-10, Appendix B electrical and I&C commodity groups. Waterford 3 passive electrical commodity groups correspond to Item 77 of the NEI 95-10 passive electrical and I&C commodity groups. Item 77 of NEI 95-10, Appendix B meets the 10 CFR 54.21(a)(1)(i) criterion (i.e., components that perform an intended function without moving parts or without a change in configuration):

- Cables and connections, bus, electrical portions of electrical and I&C penetration assemblies, fuse holders outside of cabinets of active electrical components.

The 230 kV switchyard commodities are not included in the Waterford 3 equipment database because Transmission and Distribution is responsible for their maintenance. However, the following additional switchyard commodities meet the 10 CFR 54.21(a)(1)(i) screening criterion:

- High voltage insulators (corresponds to Item 87 of NEI 95-10, Appendix B).
- Switchyard bus and connections.
- Transmission conductors and connections.

All of these commodity groups were subdivided as shown in Table 2.5-1. Other Waterford 3 electrical and I&C commodity groups are active and do not require aging management review.

Electrical and I&C components whose primary function is electrical can also have a mechanical pressure boundary function. These components may include items such as elements, resistance temperature detectors, sensors, thermocouples, transducers, solenoid valves, heaters, and dryers. According to Appendix B of NEI 95-10, the electrical portions of these components are active per 10 CFR 54.21(a)(1)(i) and are therefore not subject to aging management review. Only the pressure boundary of such an in-scope component is subject to aging management review, and the pressure boundary function for these electrical and I&C components is addressed in the mechanical review.

Electrical components are supported by structural commodities (e.g., cable trays, electrical penetrations, conduit, or cable trenches), which are included in the structural aging management reviews.

2.1.2.3.2 Long-Lived Screening

Electrical components and electrical and I&C penetration assemblies included in the EQ program per 10 CFR 50.49 are subject to replacement based on their qualified life. Therefore, in accordance with 10 CFR 54.21(a)(1)(ii), EQ electrical and I&C components are not subject to aging management review. EQ electrical and I&C components are covered by analyses or calculations that may be time-limited aging analyses (TLAAs) as defined in 10 CFR 54.3. Only components that are not in the EQ program are subject to aging management review.

2.1.2.4 Consumables

Consumables include such items as packing, gaskets, component seals, O-rings, structural sealants, oil, grease, component filters, system filters, fire extinguishers, fire hoses, and air packs. Consumables have been evaluated consistent with the information presented in Table 2.1-3 of NUREG-1800. 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.

2.1.2.4.1 Packing, Gaskets, Component Seals, and O-Rings

Packing, gaskets, component mechanical seals, and O-rings are typically used to provide a leak-proof seal when components are mechanically joined together. These items are commonly found in components such as valves, pumps, heat exchangers, ventilation units or ducts, and piping segments.

In accordance with American National Standards Institute (ANSI) B31.1 and the ASME Boiler and Pressure Vessel Code Section III, the subcomponents of pressure retaining components as shown above are not considered pressure-retaining parts. Therefore, these subcomponents are not relied on to perform a license renewal intended function and are not subject to aging management review.

2.1.2.4.2 Structural Sealants

Elastomers and other materials used as structural sealants are subject to aging management review if they are not periodically replaced and they perform an intended function, typically supporting a pressure boundary, flood barrier, or rated fire barrier.

Seals and sealants are considered in the aging management review of bulk commodities (Section 2.4.4).

2.1.2.4.3 Oil, Grease, and Component Filters

Oil, grease, and component filters have been treated as consumables because either (1) they are periodically replaced or (2) they are monitored and replaced based on condition.

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

Components such as system filters, fire hoses, fire extinguishers, self-contained breathing apparatus (SCBA), and SCBA cylinders are considered to be consumables and are routinely tested, inspected, and replaced when necessary. Fire protection equipment performance criteria at Waterford 3 comply with the applicable safety standards (e.g., 10 CFR 50, Appendix R/ Appendix A to Branch Technical Position BTP-APCSB 9.5.1 or NFPA 805 (2001 Edition) in accordance with 10 CFR 48(c), NFPA 10 for fire extinguishers, fire hoses and SCBA air cylinders, and 29 CFR 1910.134 for respiratory protection), which specify performance and condition monitoring programs for these specific components. Fire hoses and fire extinguishers are inspected and hydrostatically tested periodically and must be replaced if they do not pass the test or inspection. SCBA and SCBA cylinders are inspected and periodically tested and must be repaired or replaced if they do not pass the test or inspection. Fire protection and radiation protection procedures specify the replacement criterion of these components that are routinely checked by tests or inspections to assure operability. Therefore, while these consumables are in the scope of license renewal, they do not require an aging management review.

2.1.3 Interim Staff Guidance Discussion

As discussed in NEI 95-10 (Ref. 2.1-8), the NRC has encouraged applicants for license renewal to address proposed interim staff guidance (ISGs) in the LRA. The majority of license renewal-related ISGs have been resolved (Ref. 2.1-9, 2.1-10) with the issuance of revisions to the license renewal guidance documents NUREG-1800 (Ref. 2.1-2), NUREG-1801 (Ref. 2.1-3), RG 1.188 (Ref. 2.1-4), RG 4.2 (Ref. 2.1-11), and NEI 95-10. The remaining ISGs are addressed as follows.

LR-ISG-2011-01 Aging Management of Stainless Steel Structures and Components in Treated Borated Water (Revision 1)

This ISG recommends guidance for aging management presented as revisions to selected tables of NUREG-1800 (Ref. 2.1-2) and NUREG-1801 (Ref. 2.1-3). The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results presented in Section 3.

LR-ISG-2011-02 Aging Management Program for Steam Generators

This ISG recommends the use of guidance provided in Revision 3 of NEI 97-06, Steam Generator Program Guidelines, issued after NUREG-1800 (Ref. 2.1-2) and NUREG-1801 (Ref. 2.1-3). The ISG also updates NUREG-1800 to reference Revision 3 of Electric Power Research Institute (EPRI) 1019038, *Steam Generator Integrity Assessment Guidelines*. The Waterford 3 Steam Generator Integrity Program (Section B.1.37) is based on these current steam generator inspection program guidance documents.

LR-ISG-2011-03 Generic Aging Lessons Learned (GALL) Report Revision 2 [Aging Management Program] AMP XI.M41, "Buried and Underground Piping and Tanks"

This ISG provides expanded guidance for managing the effects of aging of buried and underground piping and tanks within the scope of license renewal. This guidance is presented as revisions to NUREG-1800 (Ref. 2.1-2) and NUREG-1801 (Ref. 2.1-3). The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results presented in Section 3 and the aging management program description presented in Appendix B, Section B.1.3, Buried and Underground Piping and Tanks Inspection.

LR-ISG-2011-04 Updated Aging Management Criteria for Reactor Vessel Internal Components of Pressurized Water Reactors

This ISG updates the guidance for the aging management of reactor vessel internals presented in NUREG-1800 (Ref. 2.1-2) and NUREG-1801 (Ref. 2.1-3) to be consistent with EPRI 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," and the associated NRC safety evaluation report. The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results presented in Section 3 and the aging management program description presented in Appendix B, Section B.1.33, Reactor Vessel Internals.

LR-ISG-2011-05 Ongoing Review of Operating Experience

This ISG establishes a framework for the consideration of operating experience concerning aging management and age-related degradation during the term of a renewed operating license. The ISG provides interim revisions to NUREG-1800 (Ref. 2.1-2) and NUREG-1801 (Ref. 2.1-3) to present new NRC review criteria for the operating experience review program. The revised guidance is reflected in the description of the process for the review of operating experience presented in Appendix B, Section B.0.4, Operating Experience.

LR-ISG-2012-01 Wall Thinning due to Erosion Mechanisms

This ISG provides additional guidance for managing the effects of wall thinning due to aging mechanisms other than flow-accelerated corrosion (FAC). The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results presented in Section 3 and the aging management program descriptions presented in Appendix B.

LR-ISG-2012-02 Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion Under Insulation

This ISG provides guidance on a variety of topics as indicated by the title. The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results presented in Section 3 and the aging management program descriptions presented in Appendix B.

LR-ISG-2013-01 Aging Management of Loss of Coating or Lining Integrity for Coatings/Linings on In-Scope Piping, Piping Components, Heat Exchangers, and Tanks

This ISG provides guidance related to managing loss of coating integrity. The revised guidance has been considered in the integrated plant assessment and is reflected in the aging management results presented in Section 3 and the aging management program descriptions presented in Appendix B.

LR-ISG-2015-01 (Draft) Changes to Buried and Underground Piping and Tank Recommendations

This ISG provides proposed guidance related to managing loss of material for the external surfaces of buried and underground piping and tanks. Due to the draft nature of the ISG and the timing of its issuance, it was not feasible to include recommended activities from this ISG into the Waterford 3 LRA.

2.1.4 <u>Generic Safety Issues</u>

In accordance with the guidance in NEI 95-10 (Ref. 2.1-8), review of NRC generic safety issues (GSIs) as part of the license renewal process is required to satisfy the finding required by 10 CFR 54.29. GSIs designated as unresolved safety issues (USIs) and High- and Medium-priority issues in NUREG-0933, Appendix B (Ref. 2.1-5), that involve aging effects for structures and components subject to an aging management review or time-limited aging analysis evaluations are to be addressed in the LRA. A review of the version of NUREG-0933 current six months prior to the license renewal application submittal, including the applicable Generic Issue Management Control System Report (Ref. 2.1-6), determined that there were no outstanding USIs or High- or Medium-priority GSIs. Two GSIs designated as Active in NUREG-0933, Appendix B, 186 and 193, were reviewed to assure they did not involve aging effects for structures and components subject to an aging management review or time-limited aging analysis evaluations.

Item 186, Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants, involves issues related to crane design and operation. Aging effects are not central to these issues. The issue does not involve time limited aging analysis evaluations, including typical crane related TLAAs such as cyclic loading analyses. This issue was closed on January 27, 2012. (Ref. 2.1-7)

Item 193, [Boiling Water Reactor] BWR [Emergency Core Cooling System] ECCS Suction Concerns, addresses the possible failure of low pressure emergency core cooling systems due to unanticipated, large quantities of entrained gas in the suction piping from suppression pools in BWR Mark I containments. This issue is not applicable to Waterford 3.

Therefore, there are no GSIs involving aging effects for structures and components subject to an aging management review or time-limited aging analysis evaluations that are relevant to the Waterford 3 license renewal process.

2.1.5 Conclusion

The methods described in Sections 2.1.1 and 2.1.2 were used at Waterford 3 to identify the systems and structures that are within the scope of license renewal and to identify those structures and components requiring aging management review. The methods are consistent with and satisfy the requirements of 10 CFR 54.4 and 10 CFR 54.21(a)(1).

2.1.6 References

2.1-1 10 CFR 54, Requirements for Renewal of Operating Licenses for Nuclear Power Plants.

2.1-2 *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants.* NUREG-1800. U.S. Nuclear Regulatory Commission (NRC). Revision 2. December 2010.

2.1-3 *Generic Aging Lessons Learned (GALL) Report*. NUREG-1801. U.S. NRC. Revision 2. December 2010.

2.1-4 Standard Format and Content for Applications to Renew Nuclear Power Plant Operating Licenses, Regulatory Guide 1.188. U.S. NRC. Revision 1. September 2005.

2.1-5 *Resolution of Generic Safety Issues (Formerly entitled "A Prioritization of Generic Safety Issues")*. NUREG-0933. (Appendix B, Applicability of NUREG-0933 Issues to Operating and Future Reactor Plants, Revision 25, September 30, 2011). U.S. NRC. December 2011.

2.1-6 Generic Issue Management Control System Report For Fiscal Year 2015 3rd Quarter, NRC Agencywide Documents Access and Management System [ADAMS] Accession number ML15175A059.

2.1-7 Leeds, E. J., Director, NRC Office of Nuclear Reactor Regulation, to R. W. Borchardt, NRC Executive Director for Operations, “Completion of Generic Issue 186, ‘Potential Risk and Consequences of Heavy Load Drops in Nuclear Power Plants.’” Memorandum dated January 27, 2012. NRC ADAMS Accession number ML113050589.

2.1-8 *Industry Guideline on Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule*. NEI 95-10. Nuclear Energy Institute. Revision 6. June 2005.

2.1-9 Kuo, P. T. (NRC) to A. Marion (NEI) and D. Lochbaum (Union of Concerned Scientists), Summary of the 2001–2005 Interim Staff Guidance for License Renewal. Letter dated February 6, 2007.

2.1-10 *Disposition of Public Comments and Technical Bases for Changes in the License Renewal Guidance Documents NUREG-1801 and NUREG-1800.* NUREG-1950. Table A-8, Summary of Changes to the Updated License Renewal Documents as a Result of License Renewal Interim Staff Guidance (LR-ISG). U.S. NRC. April 2011.

2.1-11 Preparation of Environmental Reports for Nuclear Power Plant License Renewal Applications. Regulatory Guide 4.2, Supplement 1. U.S. NRC. Revision 1. June 2013.

2.2 PLANT LEVEL SCOPING RESULTS

Tables 2.2-1, 2.2-3, and 2.2-4 list the mechanical systems, electrical and I&C systems, and structures, respectively, that are within the scope of license renewal for Waterford 3. For mechanical systems, a reference is given to the section which describes the system. For electrical systems, no description is necessary since plant electrical systems are in scope by default (see Section 2.5), but a reference to the FSAR is provided where applicable. For structures, a reference is given to the section that includes the structure in the evaluation.

Tables 2.2-2 and 2.2-5 list the systems and structures, respectively, that do not meet the criteria specified in 10 CFR 54.4(a) and are therefore excluded from the scope of license renewal. For each item on these lists, the table also provides a reference (if applicable) to the section of the FSAR that describes the system or structure. For structures with no FSAR reference, a brief description of the building function is given. None of these structures house safety-related equipment nor are they situated such that a failure of the structure would impact a safety function.

The list of systems used in these tables and determination of system boundaries is based on the Waterford 3 equipment database. The equipment database is a controlled list of plant systems and components, with each component assigned to one plant system. System intended functions are identified in the section referenced in Table 2.2-1. As needed, system components are grouped functionally for the aging management review. For example, ASME Class 1 components in various systems are evaluated with the ASME Class 1 reactor coolant pressure boundary in Section 2.3.1.3, and containment penetrations from various systems are grouped into one containment penetrations review in Section 2.3.2.3. For each system, the discussion under “Components Subject to Aging Management Review” provides further information.

The LRA section describing the system provides references to relevant sections of the FSAR. If the system is described in the FSAR with a different system or under a different system name, an explanation is given.

As described in the FSAR, safety-related piping and valves support the pressure boundaries between the containment vessel and the shield building (primary containment), through the shield building (secondary containment) and across the auxiliary building secondary containment enclosure (secondary containment). For license renewal, these barriers are functionally equivalent and will be referred to as "containment pressure boundary." The safety-related piping and valves have a safety function to "support containment pressure boundary."

Nonsafety-related components whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] due to the potential for a physical interaction (see Section 2.1.1.2) are evaluated together by system in the (a)(2) aging management reviews (AMRs). The (a)(2) AMRs include nonsafety-related components with the potential for spatial interaction with safety-related components as well as components in safety-related systems outside the safety class pressure boundary, such as piping, valves, pumps, and support elements, that are required to be structurally sound in order to maintain the integrity of safety class piping. That is, the system intended function, “Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function” includes the function of components that provide structural/seismic support to directly connected components. The (a)(2) system reviews are presented at the end of the mechanical system sections: Section 2.3.1.5, RCS Systems in Scope for 10 CFR 54.4(a)(2); Section 2.3.2.4, ESF Systems in Scope for 10 CFR 54.4(a)(2); Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2); and Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2).

Components subject to aging management review are highlighted on license renewal drawings. A list of drawings is provided for each aging management review. For further discussion of license renewal drawings, see Section 2.1.2.1.3.

The list of plant structures was developed from a review of plant layout drawings, the FSAR, maintenance rule documentation, and relevant design basis documents. Structure intended functions are identified in the section referenced in Table 2.2-4. Structural commodities associated with mechanical systems, such as pipe supports and insulation, are evaluated with the structural bulk commodities.

Because of the bounding approach used for scoping electrical and I&C equipment, all plant electrical and I&C commodities contained in electrical and mechanical systems are in scope by default. Descriptions of each electrical system are not provided. In addition to plant electrical systems, certain switchyard components in the offsite power systems are in scope for support of offsite power recovery following a station blackout. For further information on electrical and I&C systems, see Section 2.5, Scoping and Screening Results: Electrical and Instrumentation and Control Systems.

Table 2.2-1
Mechanical Systems Within the Scope of License Renewal

System Code	System Name	LRA Section Describing System
AE	Air Evacuation	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
ARR	Airborne Radioactivity Removal	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
ANP	Annulus Negative Pressure	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
ACC	Auxiliary Component Cooling Water	Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water
AS	Auxiliary Steam	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
BD	Blowdown	Section 2.3.4.4, Main Steam
BAM	Boric Acid Makeup	Section 2.3.3.1, Chemical and Volume Control
BM	Boron Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SVS	Cable Vault & Switchgear Ventilation	Section 2.3.3.12, Miscellaneous HVAC
CVC	Chemical and Volume Control	Section 2.3.3.1, Chemical and Volume Control
CF	Chemical Feed	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
CHW RFR SCH SCC	Chilled Water	Section 2.3.3.2, Chilled Water
CW	Circulating Water	Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water
CC	Component Cooling Water	Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water
IA SA	Compressed Air	Section 2.3.3.4, Compressed Air
CD	Condensate	Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

Table 2.2-1 (Continued)
Mechanical Systems Within the Scope of License Renewal

System Code	System Name	LRA Section Describing System
CMU DW	Condensate Makeup and Storage	Section 2.3.4.1, Condensate Makeup and Storage
CAP	Containment Atmosphere Purge	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
CAR	Containment Atmosphere Release	Section 2.3.3.12, Miscellaneous HVAC
CB	Containment Building (mechanical components)	Section 2.3.3.4, Compressed Air
CCS	Containment Cooling heating, ventilation, and air conditioning (HVAC)	Section 2.3.3.5, Containment Cooling HVAC
CS	Containment Spray	Section 2.3.2.1, Containment Spray
CVR	Containment Vacuum Relief	Section 2.3.2.3, Containment Penetrations
CED	Control Element Drive	Section 2.3.1.1, Reactor Vessel
CDC	Control Element Drive Mechanism Cooling	Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water
HVC	Control Room HVAC	Section 2.3.3.6, Control Room HVAC
DF	Decontamination Facility (mechanical components)	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
DFO	Diesel Fuel Oil	Section 2.3.3.8, Fire Protection: Water
EBA	Emergency Breathing Air	Section 2.3.3.4, Compressed Air
EFW	Emergency Feedwater	Section 2.3.4.2, Emergency Feedwater
EG EGA EGC EGF EGL	Emergency Diesel Generator	Section 2.3.3.7, Emergency Diesel Generator
FW	Feedwater	Section 2.3.4.3, Main Feedwater
FP OFP	Fire Protection	Section 2.3.3.8, Fire Protection: Water
FHS	Fuel Handling and Storage	Section 2.3.2.3, Containment Penetrations

Table 2.2-1 (Continued)
Mechanical Systems Within the Scope of License Renewal

System Code	System Name	LRA Section Describing System
HVF	Fuel Handling Building HVAC	Section 2.3.3.12, Miscellaneous HVAC
FS	Fuel Pool Cooling and Purification	Section 2.3.3.10, Fuel Pool Cooling and Purification
GWM	Gaseous Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
HVD	Hot Machine Shop and Decon Facility Ventilation	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
HRA	Hydrogen Recombiner and Analyzer	Section 2.3.2.3, Containment Penetrations
LRT	Leak Rate Testing	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
LWM	Liquid Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
MS	Main Steam	Section 2.3.4.4, Main Steam
NG	Nitrogen	Section 2.3.3.11, Nitrogen
PAS	Post Accident Sampling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
PW	Potable Water	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
PMU	Primary Makeup	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
PSL	Primary Sampling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
ARM PRM	Radiation Monitoring	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
HVR	Reactor Auxiliary Building HVAC	Section 2.3.3.12, Miscellaneous HVAC
RCC	Reactor Cavity Cooling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
RC	Reactor Coolant	Section 2.3.1, Reactor Coolant System Section 2.3.3.9, Reactor Coolant Pump Oil Collection

Table 2.2-1 (Continued)
Mechanical Systems Within the Scope of License Renewal

System Code	System Name	LRA Section Describing System
RS	Reheat Steam	Section 2.3.4.4, Main Steam
RWM	Resin Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SI	Safety Injection	Section 2.3.2.2, Safety Injection
SAN	Sanitation System	Section 2.3.3.14, Plant Drains
SSL CTB	Secondary Sampling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SBV	Shield Building Ventilation	Section 2.3.3.12, Miscellaneous HVAC
SS	Site Security	Section 2.3.3.13, Auxiliary Diesel Generator
SWM	Solid Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SG	Steam Generator	Section 2.3.1.4, Steam Generators
PME SP	Sump Pump	Section 2.3.3.14, Plant Drains
TW BO	Treated Water	Section 2.3.3.8, Fire Protection: Water
TC	Turbine Building Cooling Water	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
HVT	Turbine Building HVAC	Section 2.3.3.12, Miscellaneous HVAC

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

System Code	System Name	FSAR Reference
AB ABC ABF ABS	Auxiliary Boiler	None
AFW	Auxiliary Feedwater System	Section 10.4.7
CO	Carbon Dioxide	None
CHV	Chiller Building Ventilation	None
CDP CP	Condensate Polisher	Section 10.4.6 (condensate clean-up system)
EH	Electro-Hydraulic Fluid	Section 10.2.2.2.7
ES	Extraction Steam	Section 10.2.2.2.6
LOF	Feed Pump Lube Oil	None
FHD FHV	Feedwater Heater Drains and Vents	Section 10.4.7
FPV	Fire Pump House Ventilation	None
GG	Generator Gas	None
GS	Gland Seal	Section 10.4.3
HG	Hydrogen	Section 9.3.7
LOS	Lube Oil Storage and Transfer	None
HVP	Polisher Building HVAC	None
SO	Seal Oil	None
HVS SB	Service Building HVAC	None
SCW	Stator Coil Water	None
TSW	Traveling Screens and Wash	Section 10.4.5
TUR	Turbine	Section 10.2

Table 2.2-2 (Continued)
Mechanical Systems Not Within the Scope of License Renewal

System Code	System Name	FSAR Reference
LOG	Turbine Generator Lube Oil	None
WHV	Water Treatment Building Ventilation	None

Table 2.2-3
Plant Electrical and I&C Systems Within the Scope of License Renewal

System Code	System Name	FSAR Reference
DC	125V DC Distribution	Section 8.3.2
LVD	208V/120V Low Voltage Distribution	Section 8.3.1
4KV	4.16KV Electrical Distribution	Section 8.3.1
SSD	480V Station Service Distribution	Section 8.3.1
7KV	6.9KV Electrical Distribution	Section 8.3.1
ANN	Annunciator	Section 7.5.1.9.2
ATS	Anticipated Transients without Scram (ATWS)	Section 7.8
CHB	Chiller Building	None
CMF CMP CMR CMT	Communication Systems	Section 9.5.2
COL	Core Operating Limit Supervisory System	Section 7.7.1.5
CPC	Core Protection Calculator	Section 7.2.1.1.2.5
CRN	Cranes and Hoists	None
ELV	Elevators	None
LTE	Emergency Lighting	Section 9.5.1.2.5
ESF	Eng Safety Features Actuation	Section 7.3
EM	Environmental (Meteorological) Monitoring	Section 2.3.3.2
ENI	Excore Nuclear Instrumentation	Section 7.2.1.1.2.3
FPD	Fire Protection Detection	Section 9.5.1.2.2
GEN	Generator and 25KV Distribution	Section 8.2.1
HT	Heat Tracing	None
INI	In-Core Nuclear Instrumentation	Section 7.7.1.7
IC	Instrument Cabinets	None
ID	Inverters and Distribution	Section 8.3.1

Table 2.2-3 (Continued)
Plant Electrical and I&C Systems Within the Scope of License Renewal

System Code	System Name	FSAR Reference
MT	Main Transformer	Section 8.2.1
MNI[a]	Movable In-Core Nuclear Instrumentation	None
LTN	Normal Lighting Distribution	Section 9.5.3
PMC	Plant Monitoring Computer	Appendix 7.5A
PPS	Plant Protection	Section 7.1.1.1
PAC	Process Analog Control	None
RMS	Radiation Monitoring	Section 11.5.2.1
RMC	Radiation Monitoring Computer	Section 11.5.2.1
RXC	Reactor Power Cutback	Section 7.7.1.9
RR	Reactor Regulating	Section 7.7.1.1.1
RF	Refueling	None
SM	Seismic Monitoring	Section 3.7.4
ST	Startup Transformer	Section 8.2.1
[None]	Switchyard	Section 8.2.1
UAT	Unit Auxiliary Transformer	Section 8.2.1
VLP	Valve and Loose Parts Monitor	Section 4.4.6.1
WTB	Water Treatment Building	None

a. Although the MNI system has been abandoned in place, there are still a few electrical components not abandoned.

Table 2.2-4
Structures Within the Scope of License Renewal

Structure Name	LRA Section
Battery House 230kV Switchyard	Section 2.4.3, Turbine Building and Other Structures
Component Cooling Water System Structure	Section 2.4.2, Nuclear Plant Island Structure
Control House 230kv Switchyard	Section 2.4.3, Turbine Building and Other Structures
Cranes, Trolleys, Monorails and Hoists	Cranes, trolleys, monorails and hoists are evaluated as structural components or commodities of the structure in which they are located.
Fire Pump House	Section 2.4.3, Turbine Building and Other Structures
Fire Water Storage Tank Foundations	Section 2.4.3, Turbine Building and Other Structures
Fuel Handling Building	Section 2.4.2, Nuclear Plant Island Structure
Manholes, Handholes, and Duct banks	Section 2.4.3, Turbine Building and Other Structures
Nuclear Plant Island Structure	Section 2.4.2, Nuclear Plant Island Structure
Plant Stack	Section 2.4.1, Reactor Building
Reactor Auxiliary Building	Section 2.4.2, Nuclear Plant Island Structure
Reactor Building	Section 2.4.1, Reactor Building
Transformer and Switchyard Support Structures and Foundations	Section 2.4.3, Turbine Building and Other Structures
Turbine Building	Section 2.4.3, Turbine Building and Other Structures

Table 2.2-5
Structures Not Within the Scope of License Renewal

Structure Name	Structure Function or FSAR Reference
Administration Building	Provide space for administrative and support personnel.
Administration Building Access Facility	Provide office space for security and access for personnel into the protective area.
Auxiliary Boiler Foundation	Provide support of the oil-fired boiler and accessories for supplying hot water to the plant for heating purposes.
Batch Oil Tanks Foundation	FSAR Section 9.5.1.1.3
Bulk Chemical Storage Building	Provide space for the site bulk chemicals.
Chemical Storage Building	Provide space for the site water treatment chemicals for the wet cooling tower.
Chiller Building	Provide space for heating, ventilation and electrical switchgear equipment.
Condensate Polisher Building	Provide support for the condensate polisher systems six demineralizer vessels.
Condensate Storage Tank Foundation	FSAR Section 1.9.37, 9.2.6.2
Construction Support Building	Provide office space for construction and various other station personnel.
Demineralized Water Storage Tank Foundation	FSAR Section 9.2.3.2
Discharge Structure	Provide for a release path for water from the condensers and the heat exchangers to be discharged into the Mississippi River downstream of the intake structure.
Dress Out Building	Provide support for personnel dress-out (anti-contamination) measures.
Fuel Oil Storage Tank Foundation	Provide support for one 100,000 gallon fuel oil storage tank.
Generation Support Building	Provide space for office and support personnel.
Independent Spent Fuel Storage Installation (ISFSI) Cask Storage Pad	FSAR Section 1.2.2.6, 9.1.5
Intake Structure	FSAR Section 2.4.11.1, 10.4.5.2
Low-Level Radwaste Storage Facility	FSAR Section 11.4.10.5
Low Volume Waste Water Basin	Hold wastewater containing wide ranges in pH and above-normal concentrations of heavy metals.

Table 2.2-5 (Continued)
Structures Not Within the Scope of License Renewal

Structure Name	Structure Function or FSAR Reference
Maintenance Building 230kV Switchyard	Provide a work area and office space for the switchyard.
Maintenance Support Building	Provide space for the electronic repair facility, personnel equipment, and maintenance and storage space for spare parts.
Mechanical Maintenance Impound Building	Provide space for the storage of maintenance equipment and weld shop.
Multiplexer Enclosures	FSAR Appendix 7.5A
Oil Separator and Separator Pit	Provide support for the waste oil collection tank and associated equipment and provide a collection point for the site industrial waste oil for separation of the oil.
Primary and Back-up Meteorological Tower	FSAR Section 2.3.3.2
Primary Water Storage Tank Foundation	Provide support for a 260,000-gallon water storage tank, which supplies water for various makeup and flushing operations.
Radioactive Material Storage Building	FSAR Section 12.5.2.1
Secondary Make-up Water Degas and Transfer Pumps Foundation	Provide support for the degas tank and the associated pumps.
Service Building	Provide office space and work area for administrative and support personnel.
Solidification Facility	FSAR Section 11.4.4, 11.4.8
Switching Station Control House	Provide a protected area for the relay panels and batteries which control the switching station.
Tool Room	Provide storage area for tools and other equipment used for maintenance.
Waste Oil Facility	Provide support for the components related to waste oil collection.
Water Treatment Building	Provide support for the primary water treatment plant and portions of the demineralized water system.
West Side Access Facility	Provide access to the controlled access area and work space for radiation protection personnel.

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 Reactor Coolant System

System Description

The reactor coolant system (RCS) is a pressurized water reactor with two coolant loops. The reactor coolant system circulates coolant in a closed cycle, removing heat from the reactor core and internals and transferring it to the steam generators. In the equipment database, the reactor coolant (RC) system code encompasses the reactor vessel and internals, the reactor coolant loops and pumps, and the pressurizer and related equipment. The steam generators are included in a separate system code (SG).

For the purposes of the license renewal integrated plant assessment, the equipment in the RC system code will be described and evaluated in three parts: the reactor vessel, the reactor vessel internals, and the remaining reactor coolant system piping and components. The reactor coolant pump (RCP) oil collection system is reviewed in Section 2.3.3.9, Reactor Coolant Pump Oil Collection.

The RC system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide sufficient core cooling during normal plant evolutions and anticipated operational occurrences to preclude the occurrence of significant core damage.
- Provide a barrier against the release of fission products from the reactor core to the environment.
- Support containment pressure boundary.

The RC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The RC system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function (RCP oil collection) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).
- Support the evaluation that demonstrates compliance with the Commission’s regulations for pressurized thermal shock (10 CFR 50.61).

- Perform functions (maintain pressure boundary and provide core cooling) that demonstrate compliance with the Commission's regulations for fire protection (10 CFR 50.48) and for station blackout (10 CFR 50.63).

FSAR References

Section 3.9.5

Section 4.1

Chapter 5

Section 9.5.1.2.6 (oil collection system)

Components Subject to Aging Management Review

The reactor coolant system is reviewed as the following subsystems. The fuel assemblies are periodically replaced based on burnup and are not subject to aging management review.

- Section 2.3.1.1, Reactor Vessel
- Section 2.3.1.2, Reactor Vessel Internals
- Section 2.3.1.3, Reactor Coolant Pressure Boundary
- Section 2.3.1.4, Steam Generators

Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.1.5, RCS Systems in Scope for 10 CFR 54.4(a)(2).

2.3.1.1 Reactor Vessel

Description

The review of the reactor vessel includes the vessel (a component in the RC system code) and the control element drive system (system code CED).

Reactor Vessel

The purpose of the reactor vessel is to enclose and support the reactor vessel internals and the reactor core and to provide a barrier to the release of radioactive materials from the core. The reactor vessel forms part of the reactor coolant pressure boundary, containing the flow path of reactor coolant through the vessel internals and reactor core. The reactor vessel head provides penetrations for the control element assembly (CEA) extension and drive shafts, venting, and in-core instrumentation.

The reactor vessel is a right circular cylinder with two hemispherical heads. The lower head is permanently welded to the lower end of the reactor vessel shell. The closure head (also known as the reactor vessel closure head) can be removed to provide access to the reactor vessel internals. The head flange is drilled to match the vessel flange stud bolt locations. The stud bolts are fitted with spherical washers located between the closure nuts and the head flange. These washers maintain stud alignment during bolt-up when flexing of the head must be accommodated. The lower surface of the head flange is machined to provide a mating surface for the vessel closure seals.

The vessel flange is a forged ring with a machined ledge on the inside surface to support the core support barrel, which in turn supports the reactor internals and the core. The flange is drilled and tapped to receive the closure studs and is machined to provide a mating surface for the reactor vessel closure seals. An externally tapered transition section connects the flange to the cylindrical shell. Sealing is accomplished by using two silver-plated, nickel-chromium-iron (NiCrFe) alloy, self-energized O-rings. Nozzles are provided in the closure head for nuclear instrumentation and control element drive mechanisms.

The four inlet and two outlet nozzles are located radially on a common plane just below the vessel flange. Ample thickness in this vessel course provides most of the reinforcement required for the nozzles. Additional reinforcement is provided for the individual nozzle attachments. A boss located around the outlet nozzles on the inside diameter of the vessel wall provides a mating surface for the core support barrel and guides the outlet coolant flow. This boss and the outlet sleeve on the core support barrel are machined to a common contour to minimize reactor coolant bypass leakage. Shell sections are joined to the nozzle region by a transition section.

Snubbers built into the lower portion of the reactor vessel shell limit the amplitude of flow-induced vibrations in the core support barrel.

The flow skirt (baffle) is a cylinder, perforated with flow holes, and reinforced at the top and bottom with stiffening rings. The flow skirt is used to reduce inequalities in core inlet flow distributions and to prevent formation of large vortices in the lower plenum. The skirt is welded to the bottom head of the pressure vessel.

Reactor vessel intended functions for license renewal are included in the RCS intended functions in Section 2.3.1, Reactor Coolant System.

Control Element Drive

The purpose of the CED system is to control the position of the control element assemblies as a means of controlling core reactivity and reactor power. The CED system code includes the control element drive mechanism control system components, the control element drive mechanisms (CEDM), and the CEAs. The CEDMs are reviewed as part of the reactor vessel.

The CEDMs are magnetic jack type drives used to vertically position and indicate the position of the CEAs in the reactor core. The CEDM pressure housings are part of the reactor coolant pressure boundary. The motor housing assembly of the CEDM is attached to the reactor vessel head nozzle by means of a threaded joint and is seal welded. The upper pressure housing is threaded into the top of the motor housing assembly and seal welded. The upper pressure housing encloses the CEDM extension shaft and contains a vent. The upper pressure housing is threaded into the top of the motor housing assembly and seal welded. The upper pressure housing encloses the CEDM extension shaft and contains a vent. The top of the upper pressure housing is closed by means of a Versa-Vent tube.

The CED system has the following intended function for 10 CFR 54.4(a)(1).

- Support the reactor coolant pressure boundary.

The CED system has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

FSAR References

Section 5.3

Section 3.9.4

Section 4.2.2.4

Components Subject to Aging Management Review

The following subassemblies of the reactor vessel are subject to aging management review:

- Vessel shell
- Primary coolant nozzles and nozzle safe ends
- Reactor vessel closure head and nozzles
- CEDM assembly
- Incore instrumentation/heated junction thermocouple-core exit thermocouples (ICI/HJTC-CET)
- Interior and exterior attachments

The CEAs are periodically replaced based on burnup; as short-lived components, the CEAs are not subject to aging management review.

Table 2.3.1-1 lists the component types that require aging management review.

Table 3.1.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawing.

LRA-G172

Table 2.3.1-1
Reactor Vessel
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting ICI/HJTC-CET assemblies • Swageloc® modified bodies • Compression collar • Hold down nuts	Pressure boundary
Closure head • Center dome • Flange	Pressure boundary
Closure head penetrations • Vent pipe nozzle • CEDM and ICI nozzles	Pressure boundary
Closure head bolting • Studs • Nuts • Washers	Pressure boundary
Control rod drive assembly • CEDM motor housing (tube) and upper end fitting • Versa vent assembly • CEDM motor housing lower end fitting	Pressure boundary
ICI assembly • Flange adaptor • Seal plug • Swageloc® modified body • Compression collar/nut	Pressure boundary
Flow skirt	Pressure boundary
Nozzles (including safe ends) • Inlet/outlet	Pressure boundary

Table 2.3.1-1 (Continued)
Reactor Vessel
Components Subject to Aging Management Review

Component Type	Intended Function
Vessel external attachment • Vessel support pads	Structural support
Vessel external attachment • Closure head lifting lugs	Pressure boundary
Vessel internal attachments • Core stabilizing lugs • Core stop lugs	Structural support
Vessel flange (including core barrel support ledge)	Pressure boundary Structural support
Vessel shell assembly (including welds) • Bottom head - Torus - Dome • Upper shell • Intermediate shell • Lower shell	Pressure boundary

2.3.1.2 Reactor Vessel Internals

Description

The purpose of the reactor vessel internals is to properly distribute the flow of coolant delivered to the vessel, and to align, support and protect the fuel assemblies. The components of the reactor internals are divided into three major parts consisting of the core support structure assembly, the upper guide structure assembly, and the in-core instrumentation support structure. The flow skirt, although functioning as an integral part of the coolant flow path, is separate from the internals and is welded to the bottom head of the pressure vessel.

The core support structure assembly consists of the core support barrel and the lower support structure. The core support structure assembly is supported at its upper end by the upper flange of the core support barrel, which rests on a ledge in the reactor vessel. The core support barrel has four alignment keys, which align the core support barrel assembly relative to the reactor vessel and reactor vessel head. The lower flange of the core support barrel supports, secures, and positions the lower support structure. The lower support structure provides support for the core by means of a core support plate supported by columns mounted on support beams that transmit the load to the core support barrel lower flange. The core support plate provides support and orientation for the lower ends of the fuel assemblies via alignment pins. The lower end of the core support barrel is restricted from excessive lateral and torsional movement by six snubbers that interface with the pressure vessel wall.

The core shroud, which provides a flow path for the coolant, is also supported and positioned by the core support plate. The core shroud provides an envelope for the core and limits the amount of coolant bypass flow. The shroud consists of two ring sections welded together and at the bottom to the core support plate.

The upper guide structure assembly consists of the upper guide structure support plate assembly, control element assembly shrouds, holddown spring, and fuel alignment plate. The upper guide structure assembly aligns and supports the upper end of the fuel assemblies, maintains the CEA spacing, holds down the fuel assemblies during operation, and supports the in-core instrumentation plate assembly. The upper end of the assembly is a structure consisting of a support flange welded to the top of a cylinder. A support plate is welded to the inside of the cylinder approximately in the middle. The support plate aligns and supports the upper end of the CEA shrouds. The shrouds extend from the fuel alignment plate to an elevation above the upper guide structure support plate. The CEA shrouds consist of a cylindrical upper section welded to a base and a flow channel structure shaped to provide flow passage for the coolant through the fuel alignment plate. The shrouds are bolted to the fuel alignment plate. At the upper guide structure support plate, the shrouds are connected to the plate by spanner nuts. The fuel alignment plate is designed to align the upper ends of the fuel assemblies and to support and align the lower ends of the CEA shrouds.

The in-core instrumentation support system begins outside the reactor pressure vessel, penetrates the reactor vessel head, and terminates at the lower end of the fuel assembly. The in-core instrumentation nozzles are located around the perimeter of the reactor vessel head. Each instrumentation path is supported over its full length by the external guidance conduit, internal guide tubes, thimble support plate, and thimbles that extend down into selected fuel bundles. The in-core instrumentation is routed so that the detectors are located and spaced throughout the core. The guide tubes and the in-core thimbles are attached to and supported by the thimble support plate assembly.

The thimble support plate assembly fits within the confines of the reactor vessel head and rests in the recessed section of the upper guide structure assembly. Above the thimble support plate, the guide tubes bend and are gathered to form stalks that extend into the reactor vessel head instrumentation nozzles. The thimble support plate assembly is raised and lowered during refueling to withdraw and insert all instruments and their thimbles simultaneously. The pressure boundaries for the in-core instrumentation is at the reactor vessel head instrument nozzle closure, where the external electrical connections to the in-core instruments are made.

Reactor vessel internals intended functions for license renewal are included in the RCS intended functions in Section 2.3.1, Reactor Coolant System.

FSAR References

Section 3.9.5

Components Subject to Aging Management Review

The core support structure assembly, the upper guide structure assembly, and the incore instrument support structure are subject to aging management review.

Table 2.3.1-2 lists the component types that require aging management review.

Table 3.1.2-2 provides the results of the aging management review.

Table 2.3.1-2
Reactor Vessel Internals
Components Subject to Aging Management Review

Component Type	Intended Function
Reactor vessel internal connector components • Bolts, studs, nuts, washers • Locking bars, caps and keys • Dowels • Cap screws	Structural support
Lower support structure assembly • Core support plate	Flow distribution Structural support
Lower support structure assembly • Fuel alignment pins • Core support column welds • Deep core support beams • Core support beams	Structural support
Core support barrel assembly • Upper cylinder, including welds • Lower cylinder girth welds • Lower cylinder axial welds • Upper section flange • Upper section flange weld • Lower section flange • Lower section flange weld • Alignment keys • Snubber assembly shims and pins • Snubber assembly bolt	Structural support
Upper internals assembly • Upper guide structure support plate assembly • Fuel alignment plate	Structural support

Table 2.3.1-2 (Continued)
Reactor Vessel Internals
Components Subject to Aging Management Review

Component Type	Intended Function
Core shroud assembly • Shroud vertical plates • Shroud former plates • Welds	Structural support
Core shroud lug and lug inserts	Structural support
Core shroud lug dowel pins	Structural support
Upper internals CEA shroud assembly • Peripheral instrument tubes • Non-peripheral instrument tubes	Structural support
Upper internals assembly • Flow bypass insert assembly	Flow distribution
Upper internals assembly • Socket head cap screw (also referred to as CEA shroud bolts)	Structural support
CEA shroud assembly • Modified shroud ext. shaft guide sub-assembly – extension shaft guide • Tube	Structural support
CEA extension shaft guides	Structural support
Holddown spring	Structural support
ICI • Thimble – lower part	Structural support
Reactor vessel internal components not addressed in another line item	Flow distribution Structural support

2.3.1.3 Reactor Coolant Pressure Boundary

Description

The purpose of the RCS is to contain and circulate reactor coolant between the reactor core and steam generators and to provide a barrier to the release of radioactive materials from the core. The major components of the system include two parallel heat transfer loops, each containing one steam generator and two reactor coolant pumps; a pressurizer connected to one of the reactor vessel outlet pipes; and associated piping. Effluent discharges from the pressurizer safety valves are condensed and cooled in the quench tank.

System pressure is controlled by the pressurizer, where steam and water are maintained in thermal equilibrium. Steam is formed by energizing immersion heaters in the pressurizer or condensed by the pressurizer spray to limit pressure variations caused by contraction or expansion of the reactor coolant.

The average temperature of the reactor coolant varies with power level and the fluid expands or contracts, changing the pressurizer water level. The charging pumps and letdown control valves in the chemical and volume control system are used to maintain the programmed pressurizer water level. A continuous but variable letdown purification flow is maintained to keep the RCS chemistry within prescribed limits. Two charging nozzles and a letdown nozzle are provided on the reactor coolant piping for this operation. The charging flow is also used to alter the boron concentration or correct the chemistry of the reactor coolant.

Other reactor coolant loop penetrations are the pressurizer surge line in one reactor vessel outlet pipe; the four safety injection inlet nozzles, one in each reactor vessel inlet pipe; one outlet nozzle to the shutdown cooling system in each reactor vessel outlet pipe; two pressurizer spray nozzles; vent and drain connections; and sample connections and instrument connections.

Overpressure protection for the reactor coolant pressure boundary is provided by two spring-loaded safety valves connected to the top of the pressurizer. These valves discharge to the quench tank, where the steam is released under water to be condensed and cooled. If the steam discharge exceeds the capacity of the quench tank, it is relieved to the containment atmosphere through a rupture disc.

As stated in FSAR Section 5.2, the reactor coolant pressure boundary (RCPB) is defined in accordance with 10 CFR 50.2(v) to include all pressure retaining components such as pressure vessels, piping, pumps, and valves that are:

a. Part of the RCS, or

b. Connected to the RCS, up to and including any and all of the following:

    1. The outermost containment isolation valve in piping which penetrates primary reactor containment.

    2. The second of the two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment.

    3. The RCS safety valves.

The major Class 1 components of the reactor coolant pressure boundary addressed in this review include the reactor coolant pumps (RCP), reactor coolant piping, pressurizer, pressurizer safety valves, and the Class 1 portions (piping and valves) of systems connected to the RCS, which are the safety injection system and the chemical and volume control system. This review also includes non-Class 1 components of the RCS that have an intended function for license renewal but were not included in another aging management review.

RCPB intended functions for license renewal are included in the RCS intended functions in Section 2.3.1, Reactor Coolant System.

FSAR References

Chapter 5

Components Subject to Aging Management Review

The non-Class 1 sections of the safety injection system and the chemical and volume control systems are reviewed in Section 2.3.2.2, Safety Injection, and Section 2.3.3.1, Chemical and Volume Control, respectively. Nonsafety-related components of the RCPB not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.1.5, RCS Systems in Scope for 10 CFR 54.4(a)(2). Remaining RCPB components are reviewed as listed below.

Table 2.3.1-3 lists the component types that require aging management review

Table 3.1.2-3 provides the results of the aging management review.

License Renewal Drawings

Additional details for RCPB components subject to aging management review are provided in the following license renewal drawings.

Reactor Coolant System

LRA-G172

LRA-G179

LRA-G160 sh 4 (RCP oil coolers, cooling air heat exchangers, and thermal barrier heat exchangers)

Safety Injection System

LRA-G167 sh 2

LRA-G167 sh 4

Chemical and Volume Control System

LRA-G168 sh 1

LRA-G168 sh 2

Table 2.3.1-3
Reactor Coolant Pressure Boundary
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element (non-Class 1)	Pressure boundary
Heat exchanger coil (RCP lower oil cooler)	Pressure boundary
Heat exchanger water jacket (seal heat exchanger)	Pressure boundary
Heat exchanger (channel head) (RCP upper oil cooler)	Pressure boundary
Heat exchanger (shell) (RCP upper oil cooler)	Pressure boundary
Heat exchanger (tube sheet) (RCP upper oil cooler)	Pressure boundary
Heat exchanger (tubes) (RCP upper oil cooler)	Pressure boundary
Heat exchanger (tubes) (RCP motor air cooler)	Pressure boundary
Heat exchanger (channel head) (RCP motor air cooler)	Pressure boundary
Heat exchanger (tube sheet) (RCP motor air cooler)	Pressure boundary
Orifice	Flow control Pressure boundary
Piping $\geq$ 4 inch nominal pipe size (NPS)	Pressure boundary
Piping < 4 inch NPS	Pressure boundary
Piping (non-Class 1)	Pressure boundary
Piping (non-Class 1) (RCP lower oil cooler)	Pressure boundary
Piping (non-Class 1) (RV flange leak off lines)	Pressure boundary

**Table 2.3.1-3 (Continued)
Reactor Coolant Pressure Boundary
Components Subject to Aging Management Review**

Component Type	Intended Function
Pressurizer heater sheath	Pressure boundary
Pressurizer heater sleeve end caps	Pressure boundary
Pressurizer heater plug, heater sleeves and heater sheath to sleeve welds	Pressure boundary
Pressurizer heater internal support structures	Structural support
Pressurizer instrument nozzle	Pressure boundary
Pressurizer lower head	Pressure boundary
Pressurizer manway cover	Pressure boundary
Pressurizer manway gasket retainer plate	Pressure boundary
Pressurizer nozzles (spray nozzle, surge nozzle, safety nozzle)	Pressure boundary
Pressurizer shell and upper head	Pressure boundary
Pressurizer spray head	Flow control
Pressurizer support skirt	Structural support
Pressurizer welds - Instrument sleeve to instrument - Nozzle to safe-end weld overlays RCS piping hot leg - Overlay welds	Pressure boundary
Pump casing (RCP)	Pressure boundary
Pump cover (RCP)	Pressure boundary
RCS cold leg welds	Pressure boundary

**Table 2.3.1-3 (Continued)
Reactor Coolant Pressure Boundary
Components Subject to Aging Management Review**

Component Type	Intended Function
Safe end (pressurizer spray, drain, pressurizer instrument nozzles)	Pressure boundary
Safe end (hot leg and pressurizer surge, shutdown cooling and pressurizer safety)	Pressure boundary
Thermal sleeve (charging, safety injection, surge, pressurizer spray)	Structural integrity
Thermowell	Pressure boundary
Tubing (non-Class 1)	Pressure boundary
Valve body ≥ 4 inch NPS	Pressure boundary
Valve body < 4 inch NPS	Pressure boundary
Valve body (non-Class 1)	Pressure boundary

2.3.1.4 Steam Generators

Description

The purpose of the steam generator (SG) system is to transfer heat from the RCS to the secondary system coolant. Feedwater heated in the steam generators is converted to steam that drives the main turbine generator. Each steam generator is a vertical, inverted U-tube heat exchanger. Reactor coolant flows through the tubes while the secondary system coolant is on the shell side.

Reactor coolant enters at the bottom of each steam generator through the single inlet nozzle, flows upward through the U-tubes, and leaves through the two outlet nozzles. A vertical divider plate separates the inlet and outlet plenums in the lower head.

Feedwater enters the steam generator through the feedwater nozzle where it is distributed via a feedwater distribution ring. The feedwater ring is constructed with discharge nozzles which discharge at the top of the feedwater ring.

The downcomer in the steam generator is an annular passage formed by the inner surface of the steam generator shell and the cylindrical shell that encloses the vertical U-tubes. Upon exiting from the bottom of the downcomer, the secondary flow is directed upward over the vertical U-tubes. Heat transferred from the primary side converts a portion of the secondary flow into steam.

Upon leaving the vertical U-tube heat transfer surface, the steam-water mixture enters the centrifugal-type separators. These impart a centrifugal motion to the mixture and separate the water particles from the steam. The water exits from the perforated separator housing and combines with the feedwater to repeat the cycle. Final drying of the steam is accomplished by passage of the steam through the single-tier banked dryers.

The steam generators contain an integral flow limiting device consisting of seven venturis installed in the steam outlet nozzle. This flow restrictor reduces energy release to containment and loads on the steam generator internals during a postulated steam line break while also limiting the RCS cooldown rate.

Manways and handholes are provided for access to the steam generator internals.

The SG system has the following intended functions for 10 CFR 54.4(a)(1).

- Transfer heat from the reactor coolant system to the secondary system.

- Limit steam release after a steam line guillotine break to reduce energy release to containment, reduce loads on the steam generator internals, and limit RCS cooldown following steam line rupture.
- Maintain secondary system pressure boundary.
- Provide a source of steam for the turbine-driven emergency feedwater pump.
- Maintain the reactor coolant pressure boundary.

The SG system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SG system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).
- Perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

FSAR References

Section 5.4.2

Components Subject to Aging Management Review

Reactor coolant inlet and outlet piping and Class 1 instrumentation is reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. Other SG instrumentation components are reviewed in Section 2.3.4.3, Main Feedwater. SG blowdown and sampling components are evaluated in Section 2.3.4.4, Main Steam. Nonsafety-related SG components whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other reports are reviewed in Section 2.3.1.5, RCS Systems in Scope for 10 CFR 54.4(a)(2). Remaining steam generator components are reviewed as listed below.

Table 2.3.1-4 lists the steam generator components that require aging management review and their intended functions.

Table 3.1.2-4 provides the results of the aging management review for steam generator components.

License Renewal Drawings

Additional details for steam generator components subject to aging management review are provided in the following license renewal drawings.

Reactor Coolant System

LRA-G172

Main Steam System

LRA-G151 sh 1
LRA-G164 sh 5

Main Feedwater System

LRA-G153 sh 4

Table 2.3.1-4
Steam Generators
Components Subject to Aging Management Review

Component Type	Intended Function
Pressure boundary closure bolting	Pressure boundary
Tubesheet	Pressure boundary
Tube to tubesheet weld	Pressure boundary
Channel head	Pressure boundary
Partition plate	Pressure boundary
Primary inlet and outlet nozzle transition pieces	Pressure boundary
Primary side pressure nozzle	Pressure boundary
Inlet and outlet nozzle dam rings	Pressure boundary
Primary manway drain tube	Pressure boundary
Primary manway cover	Pressure boundary
Primary manway insert	Pressure boundary
Tubes	Heat transfer Pressure boundary
Tube plugs	Pressure boundary
Secondary shell (elliptical head with integral steam nozzle, upper, intermediate and lower shells, transition cone)	Pressure boundary
Flow limiter insert	Pressure boundary
Feedwater nozzle	Pressure boundary
Feedwater nozzle thermal sleeve	Pressure boundary
Instrument and sampling nozzles	Pressure boundary
Blowdown nozzle	Pressure boundary

Table 2.3.1-4 (Continued)
Steam Generators
Components Subject to Aging Management Review

Component Type	Intended Function
Secondary manway, handhole, inspection port, and recirculation nozzles	Pressure boundary
Secondary manway, handhole, inspection port, and recirculation nozzle cover plates[(a)]	Pressure boundary
Handhole and inspection port cover plates[(b)]	Pressure boundary
Handhole and inspection port diaphragms	Pressure boundary
External shell attachments	Pressure boundary
Tube support plates, anti-vibration assembly bars	Structural integrity
Wrapper barrel, associated components	Structural integrity
Recirculation nozzle sleeve, wrapper plug seal plates	Structural integrity
Anti-vibration assembly end caps, retaining rings, retaining bars, stayrod washer, tube support plate shim	Structural integrity
Stayrods, wedges, tube support components	Structural integrity
Feedwater header and support components	Structural integrity
Feedwater spray nozzles, nozzle caps, filler plates	Structural integrity
Primary separator assembly components	Structural integrity
Drain bucket assembly components	Structural integrity

Table 2.3.1-4 (Continued)
Steam Generators
Components Subject to Aging Management Review

Component Type	Intended Function
Lower deck components	Structural integrity
Middle deck components	Structural integrity
Sludge collector assembly	Structural integrity
Secondary separator components	Structural integrity
Pedestal support	Structural support
Snubber lug, key bracket	Structural support

a. Cover plates in this line apply only to ones without seal welded diaphragms.
b. Cover plates in this line apply only to ones with seal welded diaphragms.

2.3.1.5 RCS Systems in Scope for 10 CFR 54.4(a)(2)

As discussed in Sections 2.1.1.2 and 2.1.2.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of an SSC.

Functional Failure

Functional failures of nonsafety-related SSCs which could impact a safety function are identified with the individual system's evaluation and are not discussed in this section.

Physical Failure

This section summarizes the scoping and screening results for RCS systems based on 10 CFR 54.4(a)(2) because of the potential for physical interactions with safety-related equipment. Physical failures may be related to structural support or to spatial interaction.

Nonsafety-Related Systems or Components Directly Connected to Safety-Related Systems (Structural Support)

At Waterford 3, certain components and piping outside the safety class pressure boundary must be structurally sound to maintain the pressure boundary integrity of safety class piping. Systems containing such nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems) are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Nonsafety-Related Systems or Components with the Potential for Spatial Interaction with Safety-Related Systems or Components

The following modes of spatial interaction are described in Sections 2.1.1.2 and 2.1.2.1.2.

Physical Impact or Flooding

The evaluation of interactions due to physical impact or flooding resulted in the inclusion of structures and structural components. Structures and structural components are reviewed in Section 2.4, Scoping and Screening Results: Structures.

Pipe Whip, Jet Impingement, or Harsh Environments

Systems containing nonsafety-related high energy lines that can affect safety-related equipment are included in the review for the criterion of 10 CFR 54.4(a)(2). Where this

criterion affected RCS systems, those systems are within the scope of license renewal per 10 CFR 54.4(a)(2).

Leakage or Spray

Nonsafety-related portions of safety-related systems containing water, oil, or steam are considered within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) if such components are located in a space containing safety-related SSCs. RCS systems meeting this criterion are within the scope of license renewal per 10 CFR 54.4(a)(2).

The RC system and the SG system are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions.

System Descriptions

The RC system is described in Section 2.3.1, Reactor Coolant System and Section 2.3.1.3, Reactor Coolant Pressure Boundary. The SG system is described in Section 2.3.1.4, Steam Generators.

Certain nonsafety-related components in these systems are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) because of the potential for physical interactions between nonsafety-related components and safety-related equipment.

FSAR References

FSAR references are provided in the sections referenced above.

Components Subject to Aging Management Review

For each safety-to-nonsafety interface, nonsafety-related components connected to safety-related components were included up to one of the following:

(1) The first seismic anchor, which is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

(2) An equivalent anchor (restraints or supports), which is defined as a boundary point that encompasses at least two supports in each of three orthogonal directions.

(3) A boundary determined using the bounding approach, which included piping beyond the safety-to-nonsafety interface up to a flexible connection or the end of a piping run (such as a vent or drain line) or up to and including a base-mounted component.

(4) An endpoint of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

For spatial interaction, components containing water, oil, or steam and located in spaces containing safety-related equipment are subject to aging management review in this 10 CFR 54.4(a)(2) review if not already included in another system review. Components are excluded from review if their location is such that no safety function can be impacted by component failure. If a HELB analysis assumes that nonsafety-related piping in a system does not fail or assumes failure only at specific locations, then that piping is within the scope of license renewal per 10 CFR 54.4(a)(2). Appropriate components are subject to aging management review to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes maintaining structural integrity for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Series 2.3.1-5-x tables list the RCS component types that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.1.2-5-x tables provide the results of the aging management review for the RCS for 10 CFR 54.4(a)(2) based on potential for physical interactions.

System Code	System Name	Component Types	AMR Results
RC	Reactor Coolant	Table 2.3.1-5-1	Table 3.1.2-5-1
SG	Steam Generators	Table 2.3.1-5-2	Table 3.1.2-5-2

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

System Code	System Name	LRA Drawings
RC	Reactor Coolant	LRA-G172 LRA-G179
SG	Steam Generators	LRA-G162 sh 2 LRA-G164 sh 5

Table 2.3.1-5-1
Reactor Coolant System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flex hose	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.1-5-2
Steam Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

2.3.2 Engineered Safety Features

The following Engineered Safety Features (ESF) systems are described in this section.

- Section 2.3.2.1, Containment Spray
- Section 2.3.2.2, Safety Injection
- Section 2.3.2.3, Containment Penetrations
- Section 2.3.2.4, ESF Systems in Scope for 10 CFR 54.4(a)(2)

2.3.2.1 Containment Spray

System Description

The purpose of the containment spray (CS) system is to remove heat from containment following an accident inside containment. In conjunction with the containment cooling heating, ventilation and air conditioning (HVAC) system, the CS system maintains the containment pressure and temperature within design limits and limits offsite radiation levels by reducing the driving force for fission product leakage from the containment atmosphere to the external environment. The CS system also limits offsite radiation doses by the reduction of iodine in the post-accident containment atmosphere.

The CS system consists of two independent and redundant loops, each containing a CS pump, shutdown cooling heat exchanger, piping, valves, spray headers, and spray nozzles. There are two headers, each with four spray rings. Each header conforms to the shape of the containment dome. When actuated following an accident, the system has two modes of operation: the injection mode and the recirculation mode.

In the injection mode, the system pumps borated water from the refueling water storage pool (RWSP) into the spray headers and through the spray nozzles in the containment dome. When the water reaches the containment floors, it drains toward the safety injection system sump.

After low level is reached in the RWSP, the recirculation mode is initiated in which suction for the CS pumps is aligned to the safety injection system sump. During the recirculation mode, the spray water is cooled by the shutdown cooling heat exchangers prior to its discharge into the containment. The shutdown cooling heat exchangers are cooled by the component cooling water system.

The pH of water that is circulated within the containment during the recirculation mode is controlled to minimize re-evolution of iodine scrubbed from the containment atmosphere by the spray. Trisodium phosphate dodecahydrate (TSP) is stored in the containment in multiple stainless steel baskets located on the -11 ft. MSL elevation. TSP is dissolved by the containment spray water and other water draining toward the safety injection system sump and thus raises pH of the recirculated water.

The CS system has the following intended functions for 10 CFR 54.4(a)(1).

- Remove heat to maintain the containment pressure and temperature within design limits and limit offsite radiation levels by reducing the driving force for fission product leakage from the containment atmosphere to the external environment.

- Remove iodine from the containment atmosphere and retain it in solution to limit dose consequences.

- Support containment pressure boundary.

The CS system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CS system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (shutdown cooling heat exchanger) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

FSAR References

Section 6.2.2

Section 6.5.2

Components Subject to Aging Management Review

The TSP baskets are evaluated as structural components in Section 2.4.1, Reactor Building. The RWSP is a structural component and is reviewed in Section 2.4.2, Nuclear Plant Island Structure. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.2.4, ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining CS system components are reviewed as listed below.

Table 2.3.2-1 lists the component types that require aging management review.

Table 3.2.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G160 sh 3

LRA-G163

Table 2.3.2-1
Containment Spray System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heat exchanger (water jacket)	Heat transfer Pressure boundary
Nozzle	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator	Filtration Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.2.2 Safety Injection

System Description

The purpose of the safety injection (SI) system is to provide core cooling following a design basis accident. The system is designed to inject borated water into the reactor coolant system to flood and cool the reactor core and to provide heat removal from the core for extended periods following a loss of coolant accident (LOCA). The system is also designed to inject borated water into the reactor coolant system to increase the shutdown margin following a rapid cooldown due to a main steam line break. In addition to its accident related functions, portions of the safety injection system are used as part of the shutdown cooling system, which removes heat from the RCS during normal plant cooldown and refueling.

The safety injection system is comprised of the following three separate subsystems:

- High pressure safety injection system (HPSI)
- Low pressure safety injection system (LPSI)
- Safety injection tanks (SITs)

The components of these subsystems are arranged in two redundant, full-capacity trains, each functionally identical to the other. The major components of this system are three HPSI pumps, two LPSI pumps, four safety injection tanks, high-pressure injection valves, low-pressure injection valves, and the refueling water storage pool (RWSP). In addition, the system uses the shutdown cooling heat exchangers, which are part of the containment spray system.

The SI system is in standby during normal operation. SI system operation is initiated by either low reactor coolant system pressure or high containment pressure. Actuation of the system starts the HPSI and LPSI pumps and opens the valves that provide a flow path from the RWSP through these pumps to the reactor coolant system. When a low level is sensed in the RWSP, the LPSI pumps are stopped, and the HPSI pump suction is diverted to the safety injection sump in containment for recirculation of coolant. The safety injection tanks contain borated water pressurized by nitrogen cover gas. When RCS pressure drops below the SIT cover pressure, the SITs automatically discharge their contents into the RCS.

The primary function of the HPSI system is to inject borated water into the RCS if a break occurs in the RCS boundary. For small breaks, the RCS pressure remains high for a long period of time following the accident, and the HPSI system ensures that the injected flow is sufficient to maintain core cooling. The HPSI system is also used to maintain a borated water cover over the core for extended periods during recirculation mode following a LOCA.

The HPSI system is arranged in two redundant trains. The HPSI pump in each train can supply water to the RCS from either the RWSP or the safety injection sump. From the HPSI pump discharge, each header splits into four RCS cold leg injection lines and one hot leg injection line. Upon initiation of safety injection, the HPSI pumps will discharge to all four RCS cold legs. For long-term core cooling, the HPSI system is realigned for simultaneous hot and cold leg injection. A third HPSI pump, which may be aligned to either train, is provided as an installed spare. Each pump is also supplied with a recirculation flow path back to the RWSP to ensure minimum flow rates through the pump when operating at shut-off head conditions.

The LPSI system serves two functions. One is to inject large quantities of borated water into the RCS in the event of a large pipe rupture. The LPSI system delivers water from the RWSP to the RCS, via the RCS safety injection nozzles, when system pressure falls below pump shut-off head. The other function is to provide shutdown cooling flow through the reactor core and shutdown cooling heat exchanger for normal plant shutdown cooling operation or as required for long-term core cooling for small breaks. During shutdown cooling, a portion of the reactor coolant from the RCS hot legs is circulated by the LPSI pumps through the shutdown cooling heat exchangers to the LPSI headers and is returned to the RCS cold legs through the safety injection nozzles.

The HPSI and LPSI systems are similarly aligned to the RWSP and safety injection sump. However, the discharge of each LPSI pump is directed to only two of the four RCS cold legs. The LPSI pumps are also supplied with a minimum recirculation flow path to the RWSP.

The four safety injection tanks are used to flood the core with borated water following depressurization as a result of a LOCA or main steam line break (MSLB). Flow from each of the tanks is directed through a check valve and outlet valve to a single RCS cold leg via a safety injection nozzle located on the RCS piping near the reactor vessel inlet.

The SI system has the following intended functions for 10 CFR 54.4(a)(1).

- Inject borated water into the reactor coolant system to flood and cool the reactor core and to provide heat removal from the core for extended periods following a LOCA.
- Inject borated water into the reactor coolant system to increase the shutdown margin following a rapid cooldown due to an MSLB.
- Provide shutdown cooling flow through the reactor core and shutdown cooling heat exchanger for normal plant shutdown cooling operation.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The SI system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SI system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (shutdown cooling mode) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

FSAR References

Section 6.3

Section 9.3.6 (shutdown cooling)

Components Subject to Aging Management Review

Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. The RWSP is a structural component and is reviewed in Section 2.4.2, Nuclear Plant Island Structure. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.2.4, ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining SI system components are reviewed as listed below.

Table 2.3.2-2 lists the component types that require aging management review.

Table 3.2.2-2 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G160 sh 3

LRA-G162 sh 1

LRA-G163

LRA-G167 sh 1

LRA-G167 sh 2

LRA-G167 sh 3

LRA-G167 sh 4

LRA-G168 sh 1

Table 2.3.2-2
Safety Injection System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Flow control Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.2.3 Containment Penetrations

System Description

As described in FSAR Chapter 3, Section 3.8, the primary containment is a free-standing steel pressure vessel which is surrounded by a reinforced concrete shield building. The containment vessel is a cylindrical steel pressure vessel with hemispherical dome and ellipsoidal bottom that houses the reactor pressure vessel, the reactor coolant piping, the pressurizer, the quench tank, the reactor coolant pumps, the steam generators, and the safety injection tanks. It is completely enclosed by the reinforced concrete shield building. An annular space is provided between the walls and domes of the containment vessel and the concrete shield building to permit construction operations and in-service inspection.

The containment vessel and shield building contain mechanical penetrations that provide openings for process fluids to pass through the containment boundaries and still maintain containment integrity. The mechanical penetrations, their associated isolation valves, and related design features that are not included in another aging management review are included in this review. The grouping of containment isolation valves from various plant systems into a consolidated review is appropriate for scoping as indicated in NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Section 2.1.3.1.

Systems described or referenced below have the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

With the exception of the containment vacuum relief (CVR) system, the systems described below have no other system intended functions. Systems described elsewhere in the application have additional intended functions included in other aging management reviews as referenced.

Containment Vacuum Relief

The purpose of the containment vacuum relief (CVR) system is used to prevent excess external pressure on the primary containment steel shell. The system consists of two redundant penetrations that connect the shield building annulus with the containment atmosphere. The penetrations provide a flow path for air to pass from the annulus to the containment. Each flow path is provided with its own set of isolation valves, which remain closed during normal operation. In the event that the air pressure inside containment drops below that of the annulus, system instrumentation opens the automatic isolation valves, which allow air pressure in the annulus to bleed into the containment.

Pneumatic operated butterfly valves are installed on the annulus side of the containment penetrations. These valves serve as both automatic relief valves and containment isolation valves. The valves are provided with backup air accumulators that will allow valve operation in the event of a loss of instrument air. Check valves are installed on the containment side of the penetrations and serve as containment isolation valves. The valves have magnetic latches that hold the valve in the close position, but the valves will open quickly against a small differential pressure.

In addition to the intended function of supporting containment pressure boundary, the CVR system has the following intended function for 10 CFR 54.4(a)(1).

- Protect the containment vessel from external pressure by limiting the pressure differential between the shield building annulus and containment atmosphere.

Fuel Handling and Storage

The purpose of the fuel handling and storage (FHS) system is to provide the ability to defuel and refuel the reactor core. The FHS system provides a safe, effective means of transporting, handling and storing fuel and control element assemblies. The majority of the components in the FHS system code are structural components and are covered in the structural aging management reviews.

The fuel transfer tube and blind flange are considered part of this system code. These components form part of the containment pressure boundary.

Hydrogen Recombiners and Analyzers

The purpose of the hydrogen recombiners and analyzers (HRA) system is to monitor the hydrogen gas concentration in the containment and limit that concentration by recombination with oxygen. The stationary thermal recombiners each consist of an inlet pre-heater section, a heater-recombination section, and a louvered exhaust chamber. They are designed and operated on the principle of natural convection, requiring no moving parts.

The system includes two hydrogen analyzers. Each consists of sample and return lines, isolation valves, and a hydrogen analyzer that includes sample coolers, moisture separators, and sample pumps. For each unit there are seven sample lines which take six separate samples of the containment atmosphere and one sample of the annulus atmosphere. Each set of six lines has a common header inside the containment and penetrates the containment in a separate penetration assembly.

The hydrogen recombiners and analyzer components are classified as safety-related. However, consistent with changes to 10 CFR 50.44, Amendment 192 to the Waterford 3 operating license eliminated the requirement for these components to mitigate the consequences of a design basis accident. Consequently, apart from support of the containment pressure boundary, the HRA system has no safety function.

Other Systems Described Elsewhere in the Application

The following systems have containment penetrations included in this review of containment penetrations. Each of these systems is described in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

System Code	System Name
ANP	Annulus Negative Pressure
ARM	Area Radiation Monitoring (see Radiation Monitoring)
BM	Boron Management
CAP	Containment Atmosphere Purge
GWM	Gaseous Waste Management
LRT	Leak Rate Testing
PMU	Primary Makeup
PSL	Primary Sampling

FSAR References

Section 3.8

Containment Vacuum Relief

Section 3.8.2.3

Section 6.2.1.1.2

Fuel Handling and Storage

Section 9.1.4

Hydrogen Recombiners and Analyzers

Section 6.2.5.2.1

Section 6.2.5.2.2

Components Subject to Aging Management Review

The structural portions of the containment penetrations (penetration pipe sleeves) are addressed in Section 2.4.1, Reactor Building. The internals of electrical penetration assemblies are reviewed in Section 2.5, Scoping and Screening Results: Electrical and Instrumentation and Control Systems. Containment penetration components that support intended functions for other systems are evaluated with their respective systems. Containment penetration components in the Class 1 boundary are reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. Remaining containment penetration components are reviewed as listed below.

Table 2.3.2-3 lists the component types that require aging management review.

Table 3.2.2-3 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G161 sh 2	LRA-G162 sh 2
LRA-G164 sh 1	LRA-G164 sh 2
LRA-G170 sh 4	LRA-G171 sh 1
LRA-G853 sh 1	

Table 2.3.2-3
Containment Penetrations
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

2.3.2.4 ESF Systems in Scope for 10 CFR 54.4(a)(2)

As discussed in Sections 2.1.1.2 and 2.1.2.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of an SSC.

Functional Failure

Functional failures of nonsafety-related SSCs which could impact a safety function are identified with the individual system's evaluation and are not discussed in this section.

Physical Failures

This section summarizes the scoping and screening results for ESF systems based on 10 CFR 54.4(a)(2) because of the potential for physical interactions with safety-related equipment. Physical failures may be related to structural support or to spatial interaction.

Nonsafety-Related Systems or Components Directly Connected to Safety-Related Systems (Structural Support)

At Waterford 3, certain components and piping outside the safety class pressure boundary must be structurally sound to maintain the pressure boundary integrity of safety class piping. Systems containing such nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems) are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Nonsafety-Related Systems or Components with the Potential for Spatial Interaction with Safety-Related Systems or Components

The following modes of spatial interaction are described in Sections 2.1.1.2 and 2.1.2.1.2.

Physical Impact or Flooding

The evaluation of interactions due to physical impact or flooding resulted in the inclusion of structures and structural components. Structures and structural components are reviewed in Section 2.4, Scoping and Screening Results: Structures.

Pipe Whip, Jet Impingement, or Harsh Environments

Systems containing nonsafety-related high energy lines that can affect safety-related equipment are included in the review for the criterion of 10 CFR 54.4(a)(2). Where this

criterion affected ESF systems, those systems are within the scope of license renewal per 10 CFR 54.4(a)(2).

Leakage or Spray

Nonsafety-related portions of safety-related systems containing water, oil, or steam are considered within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) if such components are located in a space containing safety-related SSCs. ESF systems meeting this criterion are within the scope of license renewal per 10 CFR 54.4(a)(2).

The following ESF systems, described in the referenced sections, are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions.

- Section 2.3.2.1, Containment Spray
- Section 2.3.2.2, Safety Injection

System Descriptions

The ESF systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) because of the potential for physical interactions between nonsafety-related components and safety-related equipment are described in the sections referenced above.

FSAR References

For FSAR references for these systems, see the sections referenced above.

Components Subject to Aging Management Review

For each safety-to-nonsafety interface, nonsafety-related components connected to safety-related components were included up to one of the following:

(1) The first seismic anchor, which is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

(2) An equivalent anchor (restraints or supports), which is defined as a boundary point that encompasses at least two supports in each of three orthogonal directions.

(3) A boundary determined using the bounding approach, which included piping beyond the safety-to-nonsafety interface up to a flexible connection or the end of a piping run (such as a vent or drain line) or up to and including a base-mounted component.

(4) An endpoint of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

For spatial interaction, ESF system components containing water, oil, or steam and located in spaces containing safety-related equipment are subject to aging management review in this 10 CFR 54.4(a)(2) review if not already included in another system review. Components are excluded from review if their location is such that no safety function can be impacted by component failure. If a HELB analysis assumes that nonsafety-related piping in an ESF system does not fail or assumes failure only at specific locations, then that piping is within the scope of license renewal per 10 CFR 54.4(a)(2). Appropriate components are subject to aging management review to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes maintaining structural integrity for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Series 2.3.2-4-x tables list the component types for ESF systems that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.2.2-4-x tables provide the results of the aging management review for ESF systems for 10 CFR 54.4(a)(2) based on potential for physical interactions.

System Code	System Name	Component Types	AMR Results
CS	Containment Spray	Table 2.3.2-4-1	Table 3.2.2-4-1
SI	Safety Injection	Table 2.3.2-4-2	Table 3.2.2-4-2

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

System Code	System Name	LRA Drawings
CS	Containment Spray	LRA-G163
SI	Safety Injection	LRA-G-167 sh 1 LRA-G-167 sh 2 LRA-G-167 sh 3

Table 2.3.2-4-1
Containment Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary

Table 2.3.2-4-2
Safety Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3 Auxiliary Systems

The following systems are described in this section.

- Section 2.3.3.1, Chemical and Volume Control
- Section 2.3.3.2, Chilled Water
- Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water
- Section 2.3.3.4, Compressed Air
- Section 2.3.3.5, Containment Cooling HVAC
- Section 2.3.3.6, Control Room HVAC
- Section 2.3.3.7, Emergency Diesel Generator
- Section 2.3.3.8, Fire Protection: Water
- Section 2.3.3.9, Reactor Coolant Pump Oil Collection
- Section 2.3.3.10, Fuel Pool Cooling and Purification
- Section 2.3.3.11, Nitrogen
- Section 2.3.3.12, Miscellaneous HVAC
- Section 2.3.3.13, Auxiliary Diesel Generator
- Section 2.3.3.14, Plant Drains
- Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

2.3.3.1 Chemical and Volume Control

<u>System Description</u>

This review includes the chemical and volume control system and the boric acid makeup system.

<u>Chemical and Volume Control</u>

The purpose of the chemical and volume control (system code CVC) system is to control the reactor coolant system (RCS) inventory, purity and chemistry. Part of the reactor coolant is bypassed through the CVC system via regenerative and letdown heat exchangers, which reduce the reactor coolant temperature before it passes through a filter and ion exchangers to purify the coolant. The purified coolant can be sent to the volume control tank or diverted to the boron management system if necessary to reduce RCS inventory. Chemicals or additional coolant (e.g., primary water and boric acid) can be added to the volume control tank to adjust RCS chemistry or increase inventory. The charging pumps take suction from the volume control tank and pump the coolant back into the reactor coolant system.

Discharge from the charging pumps is normally returned through the regenerative heat exchanger to the reactor coolant system flow stream between the reactor coolant pumps and the reactor vessel. Charging pump flow can also be returned to the system as auxiliary pressurizer spray for operator control of RCS pressure during final stages of shutdown and to allow pressurizer cooling during normal operation and following an accident.

The CVC system also collects controlled bleed-off from the reactor coolant pump seals. The bleed-off flow is routed to the volume control tank and then returned to the RCS. Degasification of the reactor coolant can be performed by venting the volume control tank to the gas surge header of the gaseous waste management system. Chemicals such as zinc (Zn) and hydrazine can be added after the volume control tank and pumped directly into the RCS via the charging pumps.

The boric acid makeup (BAM) system works with the CVC system to control reactor coolant boron concentration. Concentrated boric acid from the BAM system can be added to the volume control tank to mix with the reactor coolant, or it can be delivered to the suction of the charging pumps for rapid injection into the RCS on receipt of a safety injection actuation signal.

Some components of the CVC system form part of the reactor coolant pressure boundary. Other CVC system components are part of the containment pressure boundary.

The CVC system has the following intended functions for 10 CFR 54.4(a)(1).

- Maintain the reactor coolant system inventory.

- Control boron concentration in the reactor coolant system.
- Provide auxiliary pressurizer spray.
- Inject concentrated boric acid into the reactor coolant system upon a safety injection actuation signal.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The CVC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CVC system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).
- Perform a function (letdown isolation) that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

Boric Acid Makeup

The purpose of the boric acid makeup (BAM) system is to provide a source of concentrated boric acid for RCS reactivity control and shutdown margin requirements. As part of the chemical and volume control (CVC) system, the BAM system can supply boric acid to the RCS through the volume control tank and charging pumps for normal makeup, or directly through the charging pumps if necessary for load changes or shutdown margin control following an accident. The BAM system includes the boric acid batching tank, boric acid makeup tanks, boric acid makeup pumps, and the related piping, valves, instruments and controls.

The BAM system has the following intended function for 10 CFR 54.4(a)(1).

- Provide a source of concentrated boric acid to the CVC system for RCS reactivity control and shutdown margin requirements.

The BAM system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The BAM system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

FSAR References

Section 9.3.4

Section 9.3.4.2.1.2 (BAM described as a makeup system)

Components Subject to Aging Management Review

Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. CVC system components that support safety injection system intended functions are reviewed in Section 2.3.2.2, Safety Injection. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining CVC and BAM system components are reviewed as listed below.

Table 2.3.3-1 lists the component types that require aging management review.

Table 3.3.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G160 sh 1
LRA-G162 sh 5
LRA-G163
LRA-G167 sh 3
LRA-G168 sh 1
LRA-G168 sh 2
LRA-G168 sh 3
LRA-G171 sh 1

Table 2.3.3-1
Chemical and Volume Control System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Gear box housing	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.2 Chilled Water

System Description

The purpose of the chilled water system is to provide chilled water for air handling systems in various parts of the reactor auxiliary building. There are two separate chilled water systems, the essential chilled water system and the supplementary chilled water system, with components from four different system codes: CHW (chilled water), RFR (refrigeration), SCC (supplementary chiller condensing) and SCH (supplementary chilled water).

Essential Chilled Water System

The purpose of the essential chilled water system is to provide chilled water for those air handling systems which cool spaces containing equipment required for safety-related operations. The essential chilled water system furnishes chilled water for space cooling purposes and rejects heat through the component cooling water system. The essential chilled water system includes components in system codes CHW and RFR.

The system consists of three full-capacity water chiller subsystems, each consisting of one chiller, pump, and expansion tank with level control actuated makeup, and instrumentation and controls, piping and valves. Additionally, for corrosion protection, each subsystem is provided with an individual and integral chemical feed system consisting of a chemical feed tank, chemical feed and drain piping, and all necessary valves, fittings, accessories and appurtenances.

The chiller's cool water is pumped to the cooling coils of the air handling units in various parts of the reactor auxiliary building. The safety-related chilled water loads are separated into two loops. The flow path can be aligned so that any two of the three water chiller subsystems can supply chilled water to the two cooling loops.

Supplementary Chilled Water System

The purpose of the supplementary chilled water system is to provide chilled water to nonsafety-related air handling units located in the reactor auxiliary building. The supplementary chilled water system consists of a chilled water recirculation loop with two packaged chiller units operating in series in a “lead/lag” configuration. The system components are located in the yard behind the chiller building with the chilled water supply and return piping routed underground to the reactor auxiliary building. The supplementary chilled water system includes components in system codes SCH, SCC and RFR. The SCC cooling towers were abandoned in place when the packaged chiller units were installed.

The chilled water recirculation loop consists of two half-capacity chiller units, two full-capacity pumps, eight air handling unit cooling coils, expansion tank, chemical addition pot, piping, valves, instrumentation and controls.

The essential chilled water system has the following intended function for 10 CFR 54.4(a)(1).

- Provide chilled water for those air handling systems which cool spaces containing equipment required for safety-related operations.

The essential and supplementary chilled water systems have the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The essential chilled water system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

FSAR References

Section 9.2.9 (essential services chilled water system)

None for supplementary chilled water system.

Components Subject to Aging Management Review

Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining chilled water systems components are reviewed as listed below.

Table 2.3.3-2 lists the component types that require aging management review.

Table 3.3.2-2 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G160 sh 6	LRA-G853 sh 4
LRA-G853 sh 3	LRA-G853 sh 5

**Table 2.3.3-2
Chilled Water System
Components Subject to Aging Management Review**

Component Type	Intended Function
Blower housing	Pressure boundary
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.3 Component Cooling and Auxiliary Component Cooling Water

System Description

This review covers the component cooling water system and the auxiliary component cooling water system. This review also includes supporting functions of the circulating water system and the control element drive mechanism cooling system.

Component Cooling Water

The purpose of the component cooling water (CC) system is to remove heat from the reactor coolant and the auxiliary systems during normal operation, shutdown, or emergency shutdown following a loss of coolant accident (LOCA) or a main steam line break inside containment. CC system cooling water is pumped through the dry cooling towers and the tube side of the component cooling heat exchangers, through the components being cooled, and back to the pumps. There are two redundant, independent, full-capacity CC system trains. Each CC system train is provided with an auxiliary component cooling (ACC) system loop.

The CC system includes two component cooling water heat exchangers, three full-capacity pumps, two dry cooling towers, one surge tank (baffled), one chemical addition tank, piping, valves, instrumentation and controls. The demineralized cooling water is pumped by the component cooling water pumps through two heat sinks: the dry cooling towers, where heat is dissipated to the atmosphere, and the component cooling water heat exchangers, where heat is removed by the ACC system. Component cooling water is distributed by four loops, two safety-related and two nonsafety-related. The coolant is then returned to the pumps. The component cooling water surge tank, connected to the suction side of the pumps, accommodates fluid expansion and contraction.

The CC system has the following intended functions for 10 CFR 54.4(a)(1).

- Dissipate the heat removed from the reactor and its auxiliaries during normal unit operation, during refueling, or after a design basis accident.
- Support containment pressure boundary.

The CC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CC system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

Auxiliary Component Cooling Water

The purpose of the ACC system is to remove heat from the CC system, if required, during normal operation, shutdown, or emergency shutdown following a LOCA or a main steam line break inside containment. The CC and ACC systems work together to supply sufficient cooling to safety- and nonsafety-related reactor auxiliaries under all modes of operation. This cooling is also maintained to mitigate the consequences of a design basis accident.

ACC system cooling water is pumped through the shell side of the component cooling heat exchangers, where it removes heat from the component cooling water system and rejects it to the atmosphere via the wet cooling towers. There are two redundant, independent, full-capacity ACC trains, one for each train of the component cooling water system. Each train of the ACC system includes a component cooling water heat exchanger (shell side), a full-capacity pump, and a wet type, mechanical draft cooling tower and cooling tower basin. The ACC system takes water from the wet cooling tower basin, pumps it through the component cooling water heat exchanger where its temperature is raised, and then to the wet cooling tower for heat dissipation to the atmosphere.

The ACC system is required to operate whenever the heat rejection capacity of the CC system is exceeded by accident conditions, or whenever the outside ambient conditions prevent the CC system from rejecting its required heat load by way of the dry cooling towers. If not required, the ACC system is placed in standby with the ACC pumps secured.

The ultimate heat sink consists of the CC system dry cooling towers and the ACC system wet cooling towers with water stored in the wet cooling tower basins. Each of two 100 percent capacity loops employs a dry and wet cooling tower. Each wet cooling tower consists of two cells with each cell serviced by four induced-draft fans.

Replenishment of the wet cooling tower basins from on-site water sources and/or the Mississippi River may be required in response to a tornado event if the tornado ejects water from the cooling tower basins. If available, additional makeup for the wet cooling tower basins can be supplied from onsite storage tanks (condensate storage tank, fire water storage tanks, demineralized water storage tank, and primary water storage tank). Provisions are in place (hose connections) to draw water from these sources via a nonsafety-related, portable, diesel-driven pump, which will supply water via hose directly to the basin. Additional makeup can also be provided directly to the wet cooling tower basins using the portable pump and a fire hose from the potable water supply through a fire hydrant. However, because these sources of water may not be available after a tornado, this function is not an intended function for the systems that include these sources. In the event these sources are not available, provisions are in place to use the portable, diesel-driven pump to supply water from the Mississippi River to the circulating water system, which has piping that can be used to gravity feed makeup to the basin. The function of providing makeup water to the wet cooling tower basin is an intended function of the circulating water system.

The system includes lines from the ACC pump discharge to the suction lines of the emergency feedwater system. These lines provide a source of water to the EFW pumps if the condensate storage pool is depleted during an accident.

The system also includes jockey pumps, which operate when the ACC pump is idle to keep the piping upstream of the component cooling water heat exchanger outlet temperature control valve full of water and pressurized during normal operations. Each basin is provided with an independent, nonsafety-related filtration and chemical addition system to maintain water purity and pH. This system consists of a pump, filter, and chemical feed tank.

The ACC system has the following intended functions for 10 CFR 54.4(a)(1).

- In conjunction with the component cooling system, the ACC system dissipates the heat removed from the reactor and its auxiliaries during normal unit operation, during refueling, or after a design basis accident.

- Provide a source of water to the suction of the EFW pumps if the condensate storage pool is depleted.

The ACC system has no intended function for 10 CFR 54.4(a)(2).

The ACC system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

Circulating Water

The purpose of the circulating water (CW) system is to provide cooling water to the main condenser to condense steam exhausted from the main turbine, the feedwater turbines, and other condensate drain sources. The CW system also provides cooling to the reactor coolant system by cooling steam dumped to the condenser through the bypass valves during plant startup and shutdown. The CW system also provides cooling to the turbine closed cooling water system heat exchangers and the steam generator blowdown heat exchangers. The blowdown system, boron management system, liquid waste management system, auxiliary component cooling water system, component cooling water makeup pumps, and dry cooling tower sumps discharge through the CW system.

The CW system code includes the four circulating water pumps, the river water supply pump, circulating water air evacuation pumps, vacuum breakers, piping, valves, expansion joints, instrumentation and controls. Each circulating water pump takes suction from two bays at the intake structure and discharges the water into a common distribution block from which two pipes direct the water to the condenser. Warm water from the condenser and water from auxiliary systems returns to a common distribution block and then to the discharge structure.

The CW system is credited to provide emergency makeup to wet cooling towers A and B following a tornado. A portable diesel-driven pump provides water from the Mississippi River to the CW system, which can then gravity feed makeup to the basin through underground piping.

The CW system has no intended functions for 10 CFR 54.4(a)(1).

The CW system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide a source of makeup to the wet cooling tower basins following a tornado.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CW system has no intended functions for 10 CFR 54.4(a)(3).

Control Element Drive Mechanism Cooling

The purpose of the control element drive mechanism cooling (CDC) system is to cool the magnetic jack coils of the CEDM during normal operation. The system has no safety function.

The CDC system consists of four exhaust fans, four inlet dampers, water cooling coils, and associated ductwork. Two of the four fans operate to maintain a negative pressure inside the cooling shroud for the magnetic jack coil elements. The other two fans serve as standby units. Containment air is drawn through the cooling shroud, removing heat from the CEDM magnetic jack coil. The air is drawn through the water cooling coils where the heat is rejected to the component cooling water system. Cooled air is then discharged to the containment atmosphere via the system exhaust fans. The nonsafety-related cooling coils provide a pressure boundary function for the component cooling water system.

The CDC system has no intended functions for 10 CFR 54.4(a)(1).

The CDC system has the following intended function for 10 CFR 54.4(a)(2).

- Support the component cooling water system pressure boundary.

The CDC system has no intended functions for 10 CFR 54.4(a)(3).

FSAR References

Section 9.2.2

Section 9.2.5

Section 9.4.5.7

Section 10.4.5

Components Subject to Aging Management Review

CC system components that maintain the pressure boundary of the system from instrument air accumulators to the valve operators are reviewed in Section 2.3.3.4, Compressed Air. An isolation valve for the dry cooling tower (DCT) sumps discharge to the CW system is reviewed in Section 2.3.3.14, Plant Drains. Nonsafety-related components of the CC and CW systems not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining CC/ACC/CW/CDC system components are reviewed as listed below.

Table 2.3.3-3 lists the component types that require aging management review.

Table 3.3.2-3 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G158 sh 1 (ACC)	LRA-G160 sh 2 (CC/ACC)	LRA-G160 sh 5 (CC/ACC)
LRA-G158 sh 2 (ACC)	LRA-G160 sh 3 (CC)	LRA-G160 sh 6 (CC/ACC)
LRA-G160 sh 1 (CC)	LRA-G160 sh 4 (CC)	LRA-G164 sh 5 (ACC)

Table 2.3.3-3
Component Cooling and Auxiliary Component Cooling Water Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Blower housing	Pressure boundary
Bolting	Pressure boundary
Coil	Pressure boundary
Expansion joint	Pressure boundary
Fan housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Nozzle	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.4 Compressed Air

System Description

The purpose of the compressed air system is to provide a reliable supply of dry, oil-free air for pneumatic instruments and controls, pneumatically operated valves and the necessary service air for normal plant operation and maintenance. The compressed air system is comprised of components from system codes IA (instrument air system) and SA (service air system). This review also includes the emergency breathing air system and compressed air components supporting the containment building.

The compressed air system consists of two instrument air compressors, one instrument air receiver, two instrument air dryers with pre- and after-filters, three station air compressors, one station air receiver, piping, valves and instrumentation. Each instrument air and station air compressor package consists of an inlet filter, compressor, moisture separator, heat exchanger and discharge filter. Air from either the instrument air compressor or station air compressor packages is discharged into the corresponding air receiver by a common header.

Air from the instrument air receiver is passed through one of the instrument air dryers and filters assemblies. The compressed air system then divides into various branches. Instrument air lines supply air to the demineralizer plant, yard area, turbine building, reactor auxiliary building, reactor building, fuel handling building, service building, and intake structure. In the turbine, reactor auxiliary and reactor buildings, these branches are divided into several sub-branches located at various elevations. The various air operated valves, pneumatic instruments and controls are supplied from these lines.

Downstream of the station air receiver, the system is divided into various branches. Service air lines supply air to the demineralizer plant, yard area, turbine building, reactor auxiliary building, reactor building, service building, hot machine shop and decontamination room, fuel handling building and intake structure. These branches are divided into several sub-branches in all of these buildings and are located at various elevations. Service air is used for the operation of pneumatic tools, equipment used for plant maintenance, and for occasional air lancing of the wet cooling tower basin water to control microbiological growth.

Most components of the system serve no safety function since they are not required to achieve safe shutdown or to mitigate the consequences of an accident. Air or nitrogen accumulators are provided as backup to the normal instrument air for valves required for operation during the safe shutdown of the plant following an accident or to mitigate the consequences of an accident. Nitrogen accumulators are reviewed with the nitrogen system (Section 2.3.3.11). The air accumulators and associated components supporting safety-related air operated valves are safety-related. This includes the essential instrument air system of backup accumulators provided for post-accident operation of certain containment isolation valves during a loss of instrument air. Where nitrogen accumulators provide backup for safety-related valve operation, the compressed air system components at the interface with the nitrogen system support the nitrogen pressure boundary and are also safety-related. Where compressed air system lines enter containment, components of the system support the containment pressure boundary and are safety-related.

The safety-related nitrogen accumulators are capable of providing motive air to pneumatically operated valves for 10 hours. Procedures are established for operating manual handwheel overrides or, for two accumulators, lining up backup air supplies for continued function after 10 hours. This backup air supply consists of air bottle stations that may be manually aligned to re-pressurize two accumulators following a design basis event concurrent with a loss of instrument air. These two accumulators enable control room operators to realign essential chiller cooling water valves from the wet cooling towers to the dry cooling towers to preserve wet cooling tower basin water inventory.

The compressed air system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide a reserve supply of compressed air (via accumulators, backup air bottles, and related components) to support safety functions of air operated valves for safe shutdown and accident mitigation.

- Support containment pressure boundary.

The compressed air system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The compressed air system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function (nitrogen pressure boundary) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

- Perform a function (nitrogen pressure boundary) that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

Emergency Breathing Air

The purpose of the emergency breathing air (EBA) system is to provide high quality breathing air for people in the control room envelope to ensure control room habitability during a fire and certain toxic gas events. The system includes an air compressor, purifier filters, four high-pressure air storage tanks, pressure regulators, and piping and valves for distribution to seven manifolds around the control room envelope. Each manifold has filters, a pressure regulator, an isolation valve, and quick disconnect connections for up to four breathing hoses.

The EBA system has no intended functions for 10 CFR 54.4(a)(1).

The EBA system has the following intended function for 10 CFR 54.4(a)(2).

- Provide stored, compressed air to the control room during a toxic gas release.

The EBA system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

Containment Building

The primary containment and shield building are evaluated as structures, but CB (for containment building) is used as a system code and includes several mechanical components. The purpose of the CB system mechanical components is to support the containment pressure boundary. The mechanical components include accumulators, filters, piping, and valves that support the operation and testing of seals for the maintenance hatch, the containment personnel lock, and containment escape lock.

The CB system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

The CB system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CB system has no intended functions for 10 CFR 54.4(a)(3).

FSAR References

Section 6.3.3.5 (essential instrument air)	Section 9.3.1
Section 6.4.4.2.f (EBA)	Section 9.3.9.2.1 (backup air supply)
Section 6.5.3.1	Section 9.5.1.3.1 [D.4(h)] (EBA)

Components Subject to Aging Management Review

Instrument air system components that support the nitrogen system pressure boundary are reviewed in Section 2.3.3.11, Nitrogen. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining compressed air systems components are reviewed as listed below.

Table 2.3.3-4 lists the component types that require aging management review.

Table 3.3.2-4 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G152 sh 4 (IA)	LRA-G157 (SA)
LRA-G152 sh 6 (IA)	LRA-G164 sh 2 (EBA)
LRA-G152 sh 9 (IA)	LRA-G166 sh 2 (IA)
LRA-5817-7912 (EBA)	LRA-B430 M116 (EBA)

Table 2.3.3-4
Compressed Air Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flex hose	Pressure boundary
Piping	Pressure boundary
Regulator body	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.5 Containment Cooling HVAC

System Description

The purpose of the containment cooling HVAC system (CCS) is to remove heat from the containment atmosphere, thus maintaining the containment pressure and temperature at acceptably low levels. During normal plant operations, the CCS operates continuously to maintain the pressure, temperature, and humidity. Following an accident, the CCS, in conjunction with the containment spray (CS) system, removes heat to maintain the containment pressure and temperature within design limits and limits offsite radiation levels by reducing the driving force for fission product leakage from the containment atmosphere to the external environment.

The CCS consists of four fan coolers that draw air from the containment and discharge it to a ring header around the top of containment. The fan cooler units consist of a vane axial fan and two banks of cooling coils supplied by the component cooling water system. The four fan cooler units are divided into two systems of two units each.

During normal operation, the CCS draws containment air through the water cooling coils with the axial flow fan and discharges through a back draft damper to a duct riser. Each duct riser is common to a pair of fan coolers and terminates with the cooled air being discharged into the ring header. From the ring header separate ducts feed cooled air to different parts of the containment.

The CCS has the following intended function for 10 CFR 54.4(a)(1).

- Remove heat to maintain the containment pressure and temperature within design limits and limit offsite radiation levels by reducing the driving force for fission product leakage from the containment atmosphere to the external environment.

The CCS has no intended function for 10 CFR 54.4(a)(2).

The CCS has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

FSAR References

Section 6.2.2

Components Subject to Aging Management Review

CCS components are reviewed as listed below.

Table 2.3.3-5 lists the component types that require aging management review.

Table 3.3.2-5 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G853 sh 1

LRA-G160 sh 4

Table 2.3.3-5
Containment Cooling HVAC System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cooler housing	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary
Fan housing	Pressure boundary
Flex connection	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary

2.3.3.6 Control Room HVAC

<u>System Description</u>

The purpose of the control room heating, ventilation, and air conditioning (HVC) system is to maintain the control room envelope in a habitable condition. The HVC system is designed to establish and maintain a habitable atmosphere in the event of a toxic chemical accident or a design basis accident with its resulting radioactive environment.

The control room envelope includes the control room, computer room, computer room supplementary air conditioning equipment room, HVC equipment room, emergency living quarters, emergency storage room, toilets, locker rooms, kitchen, kitchenette, supervisor's office, corridors, conference room, and vault. Control room habitability systems are required to assure that the operators can remain in the control room to operate the plant safely under normal conditions and maintain the unit in a safe condition under accident conditions.

The system consists of two full-capacity redundant air handling units (AHUs), two full-capacity toilet exhaust fans, a kitchen and conference room exhaust fan, two full-capacity redundant control room emergency filtration units, redundant isolation valves for the two emergency intakes, the normal intake, and the two separate exhausts. Other HVC equipment includes individual area dampers, heaters, and redundant equipment room AHUs. The redundant air conditioning units are served by redundant loops of the essential services chilled water system.

The system maintains a slight positive pressure relative to the outside atmosphere within the envelope during normal operations to prevent any outside air from bypassing the safety-related monitoring instrumentation located in the air intake path. A variety of purging operations may be conducted through various dampers and exhaust flow paths. These purging operations may be performed to remove smoke. The north and south emergency air intakes provide two sources of control room fresh air during radiological accident conditions.

The HVC system has three distinct and different operating modes and associated flow paths. The operating modes are the normal operating mode, safety injection actuation signal or high radiation mode, and toxic gas (e.g., chlorine or ammonia) mode. Three smoke purge flow paths can be enabled to remove smoke from the control room and computer room. These flow paths are normally automatically aligned but may be manually aligned.

The HVC system has the following intended functions for 10 CFR 54.4(a)(1).

- Remove heat from the control room following an accident.
- Provide filtered outside air following an accident to maintain a positive pressure in the control room.

- Maintain the control room air quality within limits following an accident.

The HVC system has no intended functions for 10 CFR 54.4(a)(2).

The HVC system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

FSAR References

Section 6.4

Section 9.4.1

Components Subject to Aging Management Review

HVC system components are reviewed as listed below.

Table 2.3.3-6 lists the component types that require aging management review.

Table 3.3.2-6 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G853 sh 20	LRA-G853 sh 21
LRA-G853 sh 22	LRA-G853 sh 4
LRA-G853 sh 23	LRA-G853 sh 5
LRA-G853 sh 11	

**Table 2.3.3-6
Control Room HVAC System
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.7 Emergency Diesel Generator

System Description

The purpose of the emergency diesel generator (EDG) system is to provide an emergency source of AC power to safety buses during a loss of the preferred (offsite) and standby (onsite) AC power supplies to permit the engineered safety features systems to perform their safety functions. The system includes two independent diesel generators, each with independent support systems. The diesel engines, generators, instrumentation and controls are included in system code EG (emergency generator system). The diesel support systems include components in system codes EGA (emergency diesel generator air system), EGC (emergency diesel cooling system), EGF (emergency diesel fuel system) and EGL (emergency diesel lube oil system).

The EDG air system includes starting air, control and shutdown air, and the combustion air intake and exhaust. Each diesel has two identical, redundant, skid-mounted air start systems, each consisting of an air compressor, an air receiver with two air accumulation pipes (which provide air storage capacity), an air dryer, filters, and associated valves, piping, and instrumentation. The engine is started by injecting compressed air directly into the engine cylinders in sequence. The air start system also provides air to the pneumatically operated diesel control components and the shutdown air header.

A turbocharger draws outside air for diesel combustion through a filter, silencer, and shutdown valve and supplies it at positive pressure to the diesel intake manifolds via intercooler/heaters. The driving force for the turbocharger is the exhaust gases from the diesel exhaust manifold. Diesel exhaust is directed through the turbocharger turbine and an exhaust silencer to the atmosphere.

A portable Isuzu diesel-driven air compressor is available for use during a station blackout or other times when the air receivers are depleted and cannot be repressurized by normal methods. The removable flexible hose is connected to either air receiver drain valve.

The EDG cooling system consists of an engine-driven main jacket water pump, motor-driven circulating jacket water pump, water cooler cooled by component cooling water, standby jacket water heater, standpipe (surge tank), and associated piping, valves, and instrumentation. Jacket water loads include the two inlet headers for cylinder cooling, the diesel speed governor oil cooler, the turbocharger casing, and the combustion air heaters.

The EDG fuel system consists of a crankshaft-driven primary fuel oil booster pump, direct-current (DC) motor-driven standby fuel oil booster pump, fuel oil cooler, fuel oil feed tank, filters, strainers, fuel oil storage tank, fuel oil transfer pump, fuel injection pumps, and associated piping, valves, and instrumentation.

The EDG lube oil system consists of an engine-driven main lube oil pump, motor-driven standby lube oil pump, motor-driven pre-lube pump, oil coolers cooled by the component cooling water system, strainers, filters, standby lube oil heater, crankcase oil sump, maintenance lube oil storage tank, and associated piping, valves, and instrumentation.

The EDG system has the following intended function for 10 CFR 54.4(a)(1).

- Provide an emergency source of AC power to safety buses during a loss of the preferred (offsite) and standby (onsite) AC power supplies to permit the engineered safety features systems to perform their safety functions.

The EDG system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The EDG system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

- Perform a function (portable air compressor) that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

FSAR References

Section 8.3.1.1.1	Section 9.5.6
Section 9.5.4	Section 9.5.7
Section 9.5.5	Section 9.5.8

Components Subject to Aging Management Review

Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining EDG system components are reviewed as listed below.

Table 2.3.3-7 lists the component types that require aging management review.

Table 3.3.2-7 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G164 sh 1	LRA-G164 sh 2
LRA-1564-2044	LRA-5817-9519

Table 2.3.3-7
Emergency Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function
Blower	Pressure boundary
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Flame arrestor	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Level indicator	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary

Table 2.3.3-7 (Continued)
Emergency Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.8 Fire Protection: Water

System Description

The review of the fire protection: water system includes components from the fire protection system, the diesel fuel oil system, and the treated water system.

Fire Protection

The purpose of the fire protection system is to ensure the capability to safely shutdown the reactor, maintain it in a safe shutdown condition, continue to control radioactive releases to the environment, and to prevent personnel injury and property damage in the event of a fire. The fire protection system includes components in system codes FP (fire protection system) and OFP (outside fire protection).

Fire protection within the protected area is provided by components in the FP system code. The FP system stores water for the control and suppression of anticipated fires and distributes the water through a network of underground mains and distribution piping to the sprinklers and hose stations. The FP system consists of two storage tanks, three fire pumps, a jockey pump, and the associated piping and valves to supply water to sprinklers, standpipes and hydrants. The diesel fuel oil tanks and other diesel support equipment are included in the DFO (diesel fuel oil) system code.

The three fire pumps, one motor driven and two diesel driven, can take suction from either or both of the storage tanks. The jockey pump maintains fire main pressure. The firewater pumps discharge into the distribution system.

The water distribution system consists of underground yard piping serving all plant yard fire hydrants, sprinkler systems, water spray systems, and interior standpipe systems. The underground piping forms a complete fire loop around the plant. The main fire loop supplies two other fire loops: the reactor auxiliary building, which in turn supplies the containment building, and the turbine building.

If available following a tornado, inventory from the fire water storage tanks may be used to replenish the wet cooling tower basin; however, because these tanks are not protected from tornado missiles, this is not an intended function for the tanks. The credited source is the Mississippi River through the circulating water system.

The fire protection system also includes a separate fire suppression system, with a storage tank, pumps, piping, valves, sprinklers, hydrants, and hose houses. This separate system, which includes components of system codes OFP and FP, provides fire protection for selected buildings outside the protected area.

The fire protection system includes fire dampers that are either installed in ductwork or mounted in walls. Fire dampers mounted in walls are included in the evaluation of structural commodities. Where necessary to support a license renewal intended function, fire dampers installed in ductwork are included in the evaluation of the related HVAC system.

Waterford 3 does not use a Halon fire suppression system or a carbon dioxide suppression system.

The fire protection system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

The fire protection system has no intended functions for 10 CFR 54.4(a)(2).

The fire protection system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

Diesel Fuel Oil

The purpose of the diesel fuel oil (DFO) system is to provide a supply of fuel oil for the operation of the two diesel-driven fire pumps and the auxiliary diesel generator (also referred to as the security diesel generator). The system includes tanks, piping, valves, instruments, and controls to support operation of the diesels. The auxiliary diesel generator supports lighting requirements for a station blackout.

The DFO system does not support operation of the emergency diesel generators or the auxiliary boiler, which have separate fuel oil systems (EGF and ABF respectively).

The DFO system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The DFO system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

- Perform a function that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

Treated Water

The purpose of the treated water system is to provide a water source for the fire water storage tank, demineralized water system, and sealing and cooling water for various pumps. The treated water system includes components from the system codes TW (treated water system) and BO (BOZE system, the primary water treatment package).

The treated water system is no longer used for processing raw water from the Mississippi River. The treated water system has been inactivated except for the clearwell tank, clearwell transfer pumps, bearing lubrication water pumps for the circulating water pumps, and associated piping, valves, instrumentation, and controls.

Certain components (piping and valve bodies) in the treated water system support the pressure boundary of the fire protection system. Some of these components are also in the flow path for the potable water supply to the wet cooling tower basin. However, because the availability of the potable water supply to the site is not assured following a tornado, this is not an intended function for the TW system. The credited source is the Mississippi River through the circulating water system using the portable pump. No components of the treated water system are located where physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The treated water system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The treated water system has the following intended function for 10 CFR 54.4(a)(3).

- Support the fire protection system pressure boundary.

FSAR References

Section 9.5.1   Section 9.2.3 (treated water, referred to as primary water treatment plant)

Components Subject to Aging Management Review

FP system dampers installed in ductwork that are necessary to support a license renewal intended function are reviewed in Section 2.3.3.12, Miscellaneous HVAC, and Section 2.3.3.6, Control Room HVAC. Components in the DFO system that support operation of the auxiliary diesel generator are reviewed in Section 2.3.3.13, Auxiliary Diesel Generator. Remaining components are reviewed as listed below.

Table 2.3.3-8 lists the component types that require aging management review.

Table 3.3.2-8 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G161 sh 1
LRA-G161 sh 3
LRA-G161 sh 5
LRA-G161 sh 6
LRA-G164 sh 3

Table 2.3.3-8
Fire Protection: Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Flame arrestor	Pressure boundary
Flex hose	Pressure boundary
Heat exchanger (housing)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Hydrant	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Silencer	Pressure boundary
Sprinkler	Flow control Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vortex breaker	Flow control

2.3.3.9 Reactor Coolant Pump Oil Collection

System Description

The purpose of the reactor coolant pump (RCP) oil collection system is to ensure that failure of the oil collection system does not lead to fire during normal operations or design basis accident conditions. The oil collection system consists of enclosures which encompass all externally located oil bearing components such that potential oil leakage from components will be contained and drained to an oil collection tank in a safe location. RCP oil collection components use the RC system code.

An RCP oil collection system is provided for each pump to direct lube oil to a collection tank from pressurized and unpressurized leakage sites, such as lift pump and piping, overflow lines, lube oil cooler, oil fill and drain lines and plugs, flanged connection in oil lines, and lube oil reservoirs.

A gravity drain piping system transports any accumulated oil from the drip pan enclosures to oil collection tanks. There are two 200-gallon oil collection tanks. The tanks are located inside the reactor containment building outside the biological shield wall. Each tank is vented and provided with a flame arrester and a glass liquid level gauge to provide local indication of the existence of oil in the tank. Each tank is capable of collecting oil from one RCP oil lube system(195 gallons).

The RCP oil collection system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The RCP oil collection system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

FSAR References

Section 9.5.1.1.3

Section 9.5.1.2.6

Components Subject to Aging Management Review

RCP oil collection system components are reviewed as listed below.

Table 2.3.3-9 lists the component types that require aging management review.

Table 3.3.2-9 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawing.

LRA-G164 sh 4

Table 2.3.3-9
RCP Oil Collection System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Drip pan	Pressure boundary
Enclosure	Pressure boundary
Flame arrestor	Pressure boundary
Flex hose	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.10 Fuel Pool Cooling and Purification

System Description

The purpose of the fuel pool cooling and purification (FS) system is to provide cooling and purification equipment to maintain spent fuel pool temperature, purity, and clarity within design requirements. The FS system consists of a cooling loop and a purification loop. These loops are independent and provide flow paths for transfer, purification, and draining of the refueling cavity, refueling canal, spent fuel cask decontamination area, spent fuel pool, and the refueling water storage pool.

The cooling portion is a closed loop system comprised of two half-capacity pumps and one full-capacity heat exchanger cooled by the component cooling water system. A backup spent fuel pool heat exchanger is also available when the spent fuel pool heat exchanger is out of service. The fuel pool water is drawn from the fuel pool near the surface through a strainer and is circulated by the fuel pool pumps through the fuel pool heat exchanger. From the outlet of the fuel pool heat exchanger (or backup fuel pool heat exchanger), the cooled fuel pool water is returned to the fuel pool.

The purification loop consists of the fuel pool purification pump, filter, ion exchanger, and strainers. Clarity and purity of the spent fuel pool, refueling cavity, and refueling water storage pool are maintained by these components. The purification flow is drawn from the spent fuel pool through a strainer and circulated by the pump through a filter which removes particulates, then through an ion exchanger to remove ionic material, and finally through a strainer that prevents resin beads from entering the fuel pool. The refueling cavity and refueling water storage pool also have connections to the purification loop.

The connection to the refueling water storage pool through the purification loop also may be used to provide makeup to the fuel pool. This provides a backup makeup supply to the spent fuel pool that has a seismic Category I makeup water source, the refueling water storage pool.

The FS system includes two nonsafety-related valves associated with the spent fuel cask decontamination pit that are credited as flood boundaries for the design basis flood.

The FS system includes four nonsafety-related valves that provide drainage of containment spray fluid from the refueling cavity post-LOCA.

The spent fuel storage racks are free standing and go wall-to-wall in the spent fuel pool and spent fuel cask storage area. The spent fuel storage racks are grouped into two design styles, designated as Region 1 and Region 2. Both rack styles contain Boral as the active neutron absorbing poison. The neutron absorbers and storage racks are subject to aging management review and are included in this review.

The FS system has the following intended functions for 10 CFR 54.4(a)(1).

- Remove decay heat from spent fuel assemblies.
- Support containment pressure boundary.
- Provide neutron absorption in the spent fuel pool.
- Provide structural support of fuel assemblies in the spent fuel pool.

The FS system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide a backup makeup water supply to the spent fuel pool from a seismic Category I source.
- Provide for containment spray fluid drainage from the refueling cavity post-LOCA.
- Provide flood barrier for design basis flood.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The FS system has no intended functions for 10 CFR 54.4(a)(3).

FSAR References

Sections 9.1.2, 9.1.3 (referred to as fuel pool system or spent fuel pool cooling and cleanup system)

Components Subject to Aging Management Review

The refueling cavity drainage portion of the FS system is reviewed in Section 2.3.3.14, Plant Drains. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining system components are reviewed as listed below.

Table 2.3.3-10 lists the component types that require aging management review.

Table 3.3.2-10 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G160 sh 1	LRA-G160 sh 4
LRA-G163	LRA-G169

Table 2.3.3-10
Fuel Pool Cooling and Purification System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Neutron absorber	Neutron absorption
Piping	Pressure boundary
Pump casing	Pressure boundary
Rack	Support for Criterion (a)(1) equipment
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.11 Nitrogen

System Description

The purpose of the nitrogen (NG) system is to provide nitrogen gas for normal plant operation and maintenance and for charging nitrogen accumulators associated with safety-related components.

The nitrogen system has a completely automated storage and supply network with resupply coming from a vendor tanker/trailer. The system withdraws liquid nitrogen from a storage tank via one of two positive displacement pumps. The liquid nitrogen is converted into a gas by a vaporizer unit and is stored in three high pressure storage cylinders connected to the supply header. From the supply header, nitrogen is delivered directly to the main steam isolation valve (MSIV) nitrogen charging connections located just below the MSIV actuators and to a pressure control manifold. The pressure control manifold then reduces the nitrogen pressure for distribution to various plant loads.

Nitrogen is distributed to the reactor auxiliary building, reactor containment building, and turbine generator building. Nitrogen pressure is reduced as needed to meet load requirements. The following major loads are supplied by the nitrogen system:

- Safety injection tanks
- Reactor drain tank and quench tank
- Accumulators used as backup air sources for safety-related air operated valves
- Gas surge tank, gas decay tanks, and equipment drain tank
- Volume control tank
- Boron management flash tank and holdup tanks
- Demineralized water storage tank, primary water storage tank
- Condensate storage tank
- Steam generators for blanketing and purging

Safety-related relief valve NG-1523 is installed to protect safety-related nitrogen accumulators and a containment penetration from over-pressurization should nonsafety-related pressure reducing valves and nonsafety-related pressure relief valves fail to function properly.

Two valves in the NG system support the main steam pressure boundary. This nitrogen flow path provides a nitrogen blanket to the steam generators during outages.

Valve NG-432 supplies nitrogen to the holdup tanks in the boron management system and is classified as Safety Class 3. However, since the holdup tanks do not perform a safety function, NG-432 does not perform a safety function in accordance with 10 CFR 54.4(a)(1).

The NG system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide a reserve supply of compressed nitrogen (via accumulators and related components) to support safety functions of air operated valves for safe shutdown and accident mitigation.
- Support pressure boundaries of safety-related systems that use nitrogen.
- Support containment pressure boundary.

The NG system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The NG system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function (accumulators for air operated valves) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).
- Perform a function (accumulators for air operated valves) that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

FSAR References

Section 9.3.9

Components Subject to Aging Management Review

NG system components that support SI system intended functions are reviewed in Section 2.3.2.2, Safety Injection. Two valves supporting the main steam pressure boundary are reviewed in Section 2.3.4.4, Main Steam. Safety-related valve NG-1523 does not require aging management review because the valve fails to its desired position (pressure boundary integrity is not required). Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining NG system components are reviewed as listed below.

Table 2.3.3-11 lists the component types that require aging management review.

Table 3.3.2-11 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G166 sh 1

LRA-G166 sh 2

Table 2.3.3-11
Nitrogen System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Flex hose	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Regulator body	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.12 Miscellaneous HVAC

System Description

This review includes the following site HVAC systems with intended functions for license renewal.

- Cable vault and switchgear ventilation
- Containment atmosphere release
- Fuel handling building HVAC
- Reactor auxiliary building HVAC
- Shield building ventilation
- Turbine building HVAC

For other HVAC systems not addressed here, see Section 2.3.3.5, Containment Cooling HVAC, and Section 2.3.3.6, Control Room HVAC.

Cable Vault and Switchgear Ventilation

The purpose of the cable vault and switchgear ventilation system (SVS) is to maintain a suitable operating environment for electrical equipment and prevent the accumulation of a combustible concentration of hydrogen in the battery rooms during normal and accident conditions. The SVS also provides for smoke purge in the electrical areas in the event of a fire.

The cooling part of the SVS is made up of two separate air handling subsystems, each with two full-capacity air handling units consisting of a medium efficiency filter, chilled water cooling coil, and centrifugal fan. Electric heating coils are included in the air handling units of one of the air handling subsystems. The remainder of the SVS consists of two full-capacity battery room exhaust fans for each battery room, two exhaust fans for smoke purging, one exhaust fan used during normal operation and smoke purging, and two full-capacity ventilation fans.

The SVS has the following intended functions for 10 CFR 54.4(a)(1).

- Maintain a suitable operating environment for electrical equipment during accident conditions.

- Prevent the accumulation of a combustible concentration of hydrogen in the battery rooms during accident conditions.

The SVS has no intended functions for 10 CFR 54.4(a)(2).

The SVS has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

Containment Atmosphere Release

The purpose of the containment atmosphere release (CAR) system is to purge containment at low containment atmosphere pressure. As described in FSAR Section 6.2.5, the CAR system is part of the combustible gas control system, which consists of three systems: the CAR system, a hydrogen analyzer system, and a hydrogen recombiner system (see description of the hydrogen analyzer and recombiners in Section 2.3.2.3, Containment Penetrations).

The CAR system serves as a long-term post-accident clean up system. When post-LOCA containment pressure has reduced sufficiently, the CAR system transfers gases from inside containment to the reactor building annulus. CAR system operation following a design basis accident allows fission products to be released to the shield building annulus for fission product removal by the shield building ventilation system. When containment pressures have been reduced to approximately atmospheric, the CAR system can be started to purge containment.

The CAR system consists of two full-capacity exhaust trains and two full-capacity supply trains. Each supply train draws air from the reactor auxiliary building and discharges to the containment. Each exhaust train draws a controlled amount of air from the containment and discharges into the shield building ventilation system recirculation ducting leading to the shield building annulus. The system includes containment isolation valves.

The CAR system has the following intended functions for 10 CFR 54.4(a)(1).

- Support post-accident fission product transport to the shield building annulus for removal by the shield building ventilation system.

- Support containment pressure boundary.

The CAR system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CAR system has no intended functions for 10 CFR 54.4(a)(3).

Fuel Handling Building HVAC

The purpose of the fuel handling building HVAC (HVF) system is to provide a suitable environment for personnel, equipment and controls in the fuel handling building during normal operation. During normal operation, outside air is distributed to the fuel handling building by the normal supply fan and exhausted from the building by the normal exhaust fans. The ducting for the normal flow path is designed to assure that airflow is directed from areas of low potential radioactivity to areas of progressively higher potential radioactivity.

Following a fuel handling accident, isolation dampers isolate the areas of the fuel handling building where a fuel handling accident can occur. Emergency filtration exhaust fans take suction on the spent fuel handling area of the fuel handling building with each fan pulling the air through a heater, a medium efficiency filter, high efficiency particulate air (HEPA) filters, and a charcoal adsorber. The filtered gases are then exhausted to the atmosphere.

The components of the HVF system designed to operate in response to a fuel handling accident are classified as safety-related (safety class 3). The fuel handling accident analysis was revised for the implementation of the alternate source term. The revised analysis does not credit the HVF filtration system for mitigation of the event. However, the ventilation isolation function is conservatively included as an intended function for the system.

The HVF system has the following intended function for 10 CFR 54.4(a)(1).

- Isolate the normal ventilation in the fuel handling area envelope in the event of a fuel handling accident.

The HVF system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The HVF system has no intended functions for 10 CFR 54.4(a)(3).

Reactor Auxiliary Building HVAC

The reactor auxiliary building (RAB) HVAC (HVR) system consists of the following subsystems:

- RAB normal ventilation
- RAB miscellaneous HVAC
- RAB controlled ventilation area
- Emergency diesel ventilation
- RAB H&V equipment room ventilation

RAB Normal Ventilation System

The purpose of the RAB normal ventilation system is to cool and heat parts of the reactor auxiliary building during normal operation. The RAB normal ventilation system includes a ventilation supply and ventilation exhaust system. The ventilation supply system includes filters, heating and cooling coils, two full-capacity fans, dampers, and ducting to distribute outside air throughout the reactor auxiliary building. The ventilation exhaust system includes filters, charcoal adsorbers, dampers, two full-capacity fans, and ducting to exhaust reactor auxiliary building air to the plant stack. The system includes a connection from the containment atmosphere purge system to transfer the purge exhaust to the plant stack.

The RAB normal ventilation system has individual safety-related and nonsafety-related air handling units located inside equipment rooms. The safety-related air handling units, consisting of a fan section, cooling coil and filters, operate during accident conditions when the equipment in their respective room is operating to maintain an acceptable environment for the equipment. Safety-related air handling units are located inside the following equipment rooms:

- Component cooling water pump rooms A, B and AB
- Component cooling water heat exchanger rooms A and B
- EFW pump rooms A and B
- Charging pump rooms A, B and AB
- Shutdown heat exchanger rooms A and B
- Safeguard pump room A and B
- HPSI pump room AB

These units circulate room air through the filters and cooling coil and discharge the cooled air directly to the room where they are located. The fan coolers do not include any distribution ductwork. The essential chilled water system supplies chill water to the safety-related fan coolers.

RAB Miscellaneous HVAC System

The purpose of the RAB miscellaneous HVAC system is to maintain a desirable operating environment for equipment and to provide comfort for personnel during normal operations. The RAB miscellaneous HVAC system is not required to operate during or after a design basis accident or to assist in the safe shutdown of the reactor.

The system consists of dampers, filters, heating and cooling coils, fans and distribution ducting. The system provides ventilation for various administrative areas, the hot machine shop, decontamination area, central alarm station area, and other work and storage areas.

RAB Controlled Ventilation Area System

The purpose of the RAB controlled ventilation area system (CVAS) is to provide high efficiency filtration and iodine adsorption for air exhausted from the controlled ventilation areas following a design basis accident. The controlled ventilation areas contain equipment such as the shutdown heat exchangers, containment spray pumps, the high and low pressure safety injection pumps, containment penetrations, and post-accident sampling equipment. The CVAS exhausts air from the controlled ventilation area following a LOCA to create and maintain a negative pressure relative to surrounding areas. The system limits the post-accident radiological releases to maintain dose consequences below the guidelines of 10 CFR 50.67.

The CVAS consists of exhaust ducts, isolation valves, inlet and suction valves, filter trains, exhaust fans, gravity and bypass dampers and connecting ductwork to the main exhaust duct which leads to the plant stack. The filter trains consist of a demister, electric heating coil, prefilter, upstream HEPA filter, charcoal adsorber, and downstream HEPA filter.

Emergency Diesel Ventilation System

The purpose of the EDG ventilation system is to remove the heat associated with diesel operation from the EDG A and B rooms. During normal plant operations, the RAB normal ventilation system maintains temperature in the EDG rooms. The EDG ventilation system remains in standby during normal operation, starting in conjunction with a diesel start. Each EDG room has its own separate ventilation system consisting of an outside air intake damper, an axial flow exhaust fan, a gravity damper, and an outside air exhaust louver.

RAB H&V Equipment Room Ventilation System

The purpose of the RAB heating and ventilation (H&V) equipment room ventilation system is to maintain a suitable operating environment for the equipment located in the H&V equipment room during normal or accident conditions. The RAB H&V equipment room is supplied by two full-capacity air handling units. Each unit includes a filter, heating coil, and centrifugal fan. The fans take suction either from the outside air intake or from the RAB H&V equipment room itself, depending on room temperature. Air is exhausted directly from the RAB H&V equipment room by two full-capacity exhaust fans discharging through a duct containing a gravity damper.

The reactor auxiliary building HVAC system has the following intended functions for 10 CFR 54.4(a)(1).

- Maintain an acceptable operating environment for safety-related equipment.

- Provide high efficiency filtration and iodine adsorption for all air exhausted from the controlled ventilation areas following a design basis accident.

The reactor auxiliary building HVAC system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The reactor auxiliary building HVAC system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (EDG ventilation, RAB H&V ventilation) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

Shield Building Ventilation

The purpose of the shield building ventilation (SBV) system is to control the release and removal of fission products from the shield building annulus atmosphere and to maintain annulus pressure within the assumptions of the radiological analyses following a design basis accident. The SBV system is not normally in operation. During accident conditions, this system maintains a negative pressure in the shield building annulus by mixing shield building in-leakage with the air in the annulus and discharging it through a filter train that includes charcoal and HEPA filters.

The system provides holdup and removal of fission products by recirculation and filtration using two full-capacity redundant fan and filter systems which exhaust the annular space and discharge back to the annulus or through the plant stack to the atmosphere as required to maintain a negative pressure in the annulus. On the suction side of each fan, the air is drawn sequentially through a demister, electric heating coil, prefilters, HEPA filter, charcoal adsorber and HEPA afterfilter. A backdraft damper located on the discharge side of the exhaust fan precludes backflow through the system. Downstream of the backdraft dampers, two flow paths are provided to enable discharge through the plant stack or recirculation through a supply header in the annulus.

The SBV system has the following intended functions for 10 CFR 54.4(a)(1).

- Control the release and removal of fission products from the shield building annulus atmosphere.
- Maintain annulus pressure within the assumptions of the radiological analyses.
- Support containment pressure boundary.

The SBV system has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

Turbine Building HVAC

The purpose of the turbine building ventilation (HVT) system is to provide a suitable operating environment for equipment and personnel during normal operation. The ventilation system, except for the switchgear room described below, is a single-pass type and consists of ventilation air intake louvers and dampers, supply fans, exhaust fans, and exhaust louvers and dampers distributed about the periphery of the building.

The turbine building switchgear room is separately ventilated by two half-capacity air handling units that cool the space with outside air. Each air handling unit contains a medium efficiency filter and centrifugal fan. Outside air is mixed with return air at the suction of the air handling units to maintain the temperature in the switchgear room. Heating units are mounted on the wall.

A nonsafety-related fan is used to provide ventilation for the turbine generator building (TGB) battery room. The TGB battery chargers are necessary for control power to the off-site power switchgear during a fire event where off-site power is *not* lost; in this scenario, the exhaust fan is not required. However, in a fire event where off-site power is initially lost and the TGB batteries are supplying the DC loads and discharging, then the TGB battery exhaust fan will be required once off-site power is restored to support removal of hydrogen generated from the TGB batteries during recharging.

The HVT system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The HVT system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (switchgear room and battery room ventilation) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

FSAR References

Section 9.4.3.5 (SVS)	Section 9.4.2 (HVF)	Section 6.2.3 (SBV)
Section 6.2.5 (CAR)	Section 9.4.3 (HVR)	Section 6.5.1 (SBV)
Section 6.2.5.2.3 (CAR)	Section 6.5.1.2.1.2 (HVR)	Section 9.4.4 (HVT)

Components Subject to Aging Management Review

Nonsafety-related components of the systems not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining HVAC systems components are reviewed as listed below.

Table 2.3.3-12 lists the component types that require aging management review.

Table 3.3.2-12 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

Reactor Auxiliary Building HVAC

LRA-G853 sh 11

LRA-G853 sh 15

LRA-G853 sh 16

LRA-G853 sh 17

LRA-G853 sh 18

LRA-G853 sh 19

LRA-G853 sh 21

Various HVAC (Chilled Water)

LRA-G853 sh 4

LRA-G853 sh 5

LRA-G853 sh 9

Cable Vault and Switchgear Ventilation

LRA-G853 sh 8

Containment Atmosphere Release

LRA-G853 sh 1

Fuel Handling Building HVAC

LRA-G853 sh 2

Shield Building Ventilation

LRA-G853 sh 1

Turbine Building HVAC

LRA-G853 sh 14

Table 2.3.3-12
Miscellaneous HVAC Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Flex hose	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Heater housing	Pressure boundary
Nozzle	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.13 Auxiliary Diesel Generator

System Description

This review includes the auxiliary diesel generator (ADG, a component in the site security [SS] system) and a function of the diesel fuel oil system.

Site Security

The purpose of the SS system is to provide site access controls, surveillance equipment and communications equipment used to maintain security at the site. The system includes a diesel generator to assure a continuous source of power for the security equipment, independent of the plant electrical systems. The security diesel generator, also known as the auxiliary diesel generator, is credited for station lighting during a station blackout event.

The ADG is a nonsafety-related skid-mounted turbocharged John Deere diesel engine powering a generator. The diesel has its own radiator and cooling water subsystem and therefore does not require an external cooling water supply. The diesel is electrically started from battery power. The security diesel has its own fuel tank with a 24-hour supply of fuel, which is adequate for the Waterford 3 four-hour coping analysis for station blackout. The ADG is normally in standby and operated only during testing.

The SS system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The SS system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

Diesel Fuel Oil

See Section 2.3.3.8, Fire Protection: Water for a description of the DFO system.

DFO system components supporting operation of the ADG include a fuel oil tank, piping, valves, instruments, and controls.

The DFO system has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The DFO system has the following intended function for 10 CFR 54.4(a)(3) related to the ADG.

- Perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

FSAR References

None

Components Subject to Aging Management Review

SS and DFO system components supporting the ADG are reviewed as listed below.

Table 2.3.3-13 lists the component types that require aging management review.

Table 3.3.2-13 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawing.

LRA-G164 sh 3

**Table 2.3.3-13
Auxiliary Diesel Generator System
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Flame arrestor	Pressure boundary
Piping	Pressure boundary
Silencer	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.14 Plant Drains

System Description

The review of plant drains includes components from the sump pump system (system codes SP and PME) and the sanitation system (system code SAN). The review also includes components from systems described elsewhere in the application but that support an intended function for plant drains. See "Components Subject to Aging Management Review" below.

Sump Pump

The purpose of the sump pump (SP) system is to provide for the drainage of equipment, tanks, and wetted surfaces during normal plant operations as well as anticipated large volume flows associated with abnormal or accident conditions. The review of the SP system also includes components with a PME (portable and miscellaneous) system code. Components of the SP system support both radioactive and non-radioactive drainage systems. The radioactive drainage systems and non-radioactive drainage systems are isolated from each other.

Each area housing safety-related equipment is provided with an independent drainage system and attendant sump to preclude the flooding of such areas from other drainage systems. Water discharged from fire suppression systems is handled by the floor drain systems, but this function is not credited for an internal flooding event and not credited for compliance with Appendix R. Drainage from radiologically controlled areas is routed to the waste management systems. Except as noted below, the equipment and floor drainage systems do not serve any safety function and are classified as nonsafety-related.

The sump pump system includes safety-related components in the discharge flow path from the containment sump pumps that form part of the containment pressure boundary.

The sump pump system includes components associated with the dry cooling tower (DCT) sumps. Each DCT sump is provided with a set of motor-driven sump pumps, normally aligned to discharge to the circulating water system, to protect safety-related equipment in the area. Each cooling tower area is also provided with a portable diesel-driven sump pump and hoses that can be connected during extreme rainfall events to discharge water directly over the NPIS exterior floodwall. One portable DCT diesel-driven pump and one motor-driven sump pump per DCT sump are credited in the analyses for the probable maximum precipitation (PMP) event to prevent flooding of safety-related equipment in the area. In the analysis for the standard project storm (SPS) with the simultaneous occurrence of the operating basis earthquake (OBE), a single diesel-powered sump pump per DCT sump is adequate to prevent flooding of safety-related equipment. Although piping segments through the NPIS wall are classified as safety-related (non-ASME, non-seismic), they do not perform a safety function in accordance with 10 CFR 54.4(a)(1).

Roof drains inside the NPIS are credited with removing water from the roofs of structures containing safety-related components during the PMP event. These nonsafety-related drains perform an intended function that meets the criteria of 10 CFR 54.4(a)(2) of protecting safety-related components during design basis rainfall events. These drains are evaluated as part of the SP system.

No credit is taken for floor drains or sump pumps for internal flooding events such as pipe breaks or fire system discharge; however, as discussed above, the DCT sump pumps are credited in the PMP analysis. For the ECCS equipment sumps, the section of the sump drainage line from the pump discharge check valve back to the pump protects the compartment from backflow through the drainage system.

The SP system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

The SP system has the following intended functions for 10 CFR 54.4(a)(2).

- Protect safety-related components during design basis rainfall and/or flooding events.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The SP system has no intended functions for 10 CFR 54.4(a)(3).

Sanitation

The purpose of the sanitation (SAN) system is to collect all sewage originating within the protected area and to transfer it to the municipal sanitary waste system. The system consists of lift stations and associated instrumentation, piping and valves.

Sanitary collection facilities are located at several locations within the nuclear plant island structure (NPIS) boundaries to accept sanitary waste. The sanitary drain piping is vented to atmosphere via roof vents to allow gravity flow drainage through an NPIS wall penetration at elevation +12.7 ft. MSL. This piping functions as a flood barrier for the design basis flood.

The SAN system has no intended functions for 10 CFR 54.4(a)(1).

The SAN system has the following intended function for 10 CFR 54.4(a)(2).

- Support NPIS flood barrier.

The SAN system has no intended functions for 10 CFR 54.4(a)(3).

FSAR References

Sump Pump System

Section 2.4.2.3.3 (roof drains)

Section 2.4.2.3.4 (cooling tower area)

Section 3.6A.6.4.2.1 (compartment flooding)

Section 9.3.3

Sanitation System

Section 9.2.4

Components Subject to Aging Management Review

Two condensate makeup and storage system valves (CMU-908, and CMU-909) in the fuel handling building are credited flood barrier valves between the Fuel Cask Decontamination Area, open to the train bay which is not flood protected, and the FHB sump. These valves, which are not depicted on an LRA drawing, are included in this review.

The 6-inch refueling cavity drains in the refueling cavity (LRA Drawing LRA-G163) provide for containment spray fluid drainage from the refueling cavity post-LOCA. The drains, components in the fuel pool cooling and purification system, are included in this review.

Components in sprinkler drains and in the resin waste management (RWM) system and the solid waste management (SWM) system support the NPIS flood barrier and are included in this review. The RWM and SWM systems are described in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Nonsafety-related components of the SP system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining plant drains components are reviewed as listed below.

Table 2.3.3-14 lists the component types that require aging management review.

Table 3.3.2-14 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G173 sh 1	LRA-G170 sh 5
LRA-G173 sh 2	LRA-G158 sh 2
LRA-G173 sh 3	LRA-G163

**Table 2.3.3-14
Plant Drains
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.15 Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

As discussed in Sections 2.1.1.1 and 2.1.2.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of an SSC.

Functional Failure

Functional failures of nonsafety-related SSCs which could impact a safety function are identified with the individual system's evaluation and are not discussed in this section.

Physical Failures

This section summarizes the scoping and screening results for auxiliary systems based on 10 CFR 54.4(a)(2) because of the potential for physical interactions with safety-related equipment. Physical failures may be related to structural support or to spatial interaction.

Nonsafety-Related Systems or Components Directly Connected to Safety-Related Systems (Structural Support)

At WF3, certain components and piping outside the safety class pressure boundary must be structurally sound to maintain the pressure boundary integrity of safety class piping. Systems containing such nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems) are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Nonsafety-Related Systems or Components with the Potential for Spatial Interaction with Safety-Related Systems or Components

The following modes of spatial interaction are described in Sections 2.1.1.1 and 2.1.2.1.2.

Physical Impact or Flooding

The evaluation of interactions due to physical impact or flooding resulted in the inclusion of structures and structural components. Structures and structural components are reviewed in Section 2.4, Scoping and Screening Results: Structures.

Pipe Whip, Jet Impingement, or Harsh Environments

Systems containing nonsafety-related high energy lines that can affect safety-related equipment are included in the review for the criterion of 10 CFR 54.4(a)(2). Where this

criterion affected auxiliary systems, those systems are within the scope of license renewal per 10 CFR 54.4(a)(2).

Leakage or Spray

Nonsafety-related system components or nonsafety-related portions of safety-related systems containing water, oil, or steam are considered within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) if such components are located in a space containing safety-related SSCs. Auxiliary systems meeting this criterion are within the scope of license renewal per 10 CFR 54.4(a)(2).

The following auxiliary systems, described in the referenced sections, are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions.

System Code	System Name	Section Describing System
AE	Air Evacuation	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
ARR	Airborne Radioactivity Removal	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
ANP	Annulus Negative Pressure	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
AS	Auxiliary Steam	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
BAM	Boric Acid Makeup	Section 2.3.3.1, Chemical and Volume Control
BM	Boron Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
CVC	Chemical and Volume Control	Section 2.3.3.1, Chemical and Volume Control
CF	Chemical Feed	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
CHW, RFR, SCH, SCC	Chilled Water	Section 2.3.3.2, Chilled Water
CW	Circulating Water	Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water
CC	Component Cooling Water	Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water

System Code	System Name	Section Describing System
IA, SA	Compressed Air	Section 2.3.3.4, Compressed Air
CAP	Containment Atmosphere Purge	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
CAR	Containment Atmosphere Release	Section 2.3.3.12, Miscellaneous HVAC
CB	Containment Building	Section 2.3.3.4, Compressed Air
DF	Decontamination Facility	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
EG, EGA, EGC, EGF, EGL	Emergency Diesel Generator	Section 2.3.3.7, Emergency Diesel Generator
HVF	Fuel Handling Building HVAC	Section 2.3.3.12, Miscellaneous HVAC
FS	Fuel Pool Cooling and Purification	Section 2.3.3.10, Fuel Pool Cooling and Purification
GWM	Gaseous Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
HVD	Hot Machine Shop and Decontamination Facility Ventilation	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
LRT	Leak Rate Testing	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
LWM	Liquid Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
NG	Nitrogen	Section 2.3.3.11, Nitrogen
PAS	Post Accident Sampling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
PW	Potable Water	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
PMU	Primary Makeup	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
PSL	Primary Sampling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

System Code	System Name	Section Describing System
ARM, PRM	Radiation Monitoring	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
HVR	Reactor Auxiliary Building HVAC	Section 2.3.3.12, Miscellaneous HVAC
RCC	Reactor Cavity Cooling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
RWM	Resin Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SSL, CTB	Secondary Sampling	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SWM	Solid Waste Management	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
SP, PME	Sump Pump	Section 2.3.3.14, Plant Drains
TC	Turbine Building Cooling Water	Section 2.3.3.15, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

System Descriptions

The following systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) are not described elsewhere in the application. Each system has the following intended function.

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The systems described below have components that support this intended function. For systems with intended functions that meet additional scoping criteria, the additional intended functions are noted in the descriptions below with a reference to the section where the affected components are evaluated (e.g., Section 2.3.2.3, Containment Penetrations).

Air Evacuation

The purpose of the air evacuation system (AE) is to remove air from the three condenser shells to create a vacuum in the condenser during plant startup and to maintain the vacuum by removing non-condensible gases and in-leaking air from the steam space of the three condenser shells during normal operation. The system has no safety function.

The system consists of three full-capacity condenser vacuum pump assemblies. Each assembly consists of one motor driven, rotary, water-seal type, two-stage vacuum pump and seal water system. Each seal water system includes one centrifugal circulating pump, one heat exchanger, one separator and all necessary piping, valves, instruments and electric devices.

The non-condensible gases and water vapor mixture is drawn directly from each shell of the condenser. The mixture flows through the condenser vacuum pump(s) and then to the separator, where most of the water vapor is condensed, and the non-condensible gases are released to the atmosphere via a discharge silencer. The exhaust is monitored for radioactivity prior to discharge to the atmosphere to provide early detection of a steam generator tube leak; in this event, the discharge can be routed to the reactor auxiliary building HVAC system exhaust. The condensed water normally is returned to the condenser; a backup overflow drain line is routed to the industrial waste sump.

Airborne Radioactivity Removal

The purpose of the airborne radioactivity removal (ARR) system is to limit the buildup of airborne radioactivity leaking from the reactor coolant system during normal operation, and reduce airborne radioactivity of containment atmosphere to permit personnel access inside containment during normal operation, shutdown or refueling. The system is used for radioactivity removal during normal operation only and serves no function for post-accident dose reduction. The system consists of two airborne radioactivity removal units, each consisting of a medium efficiency filter, HEPA prefilter, charcoal adsorber, and centrifugal fan.

Annulus Negative Pressure

The annulus negative pressure (ANP) system is provided to maintain the shield building annulus at a negative pressure during normal operation. This minimizes the leakage of unfiltered air to the outside atmosphere.

The system draws from the annulus through a single duct which penetrates the shield building through two isolation valves in series to two full-capacity exhaust fans arranged in parallel. The fans discharge to a single duct to the stack. The fans are stopped and the isolation valves are closed on a safety injection actuation signal (SIAS) or a containment isolation actuation signal (CIAS). Apart from support of the secondary containment pressure boundary by the isolation valves, the system has no safety function.

In addition to the 10 CFR 54.4(a)(2) function described above, the ANP system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Auxiliary Steam

The purpose of the auxiliary steam system (AS) is to distribute low pressure steam to plant auxiliary equipment. The AS system is supplied by either the main steam system or the auxiliary boiler system. The AS system supplies steam to the boric acid concentrator, the boric acid/waste concentrator, and the decontamination facility steamerette. The system includes piping and valves located in the reactor auxiliary building.

Boron Management

The purpose of the boron management (BM) system is to accept, collect, and process radioactive waste from various plant systems for recycle or disposal. The BM system provides a mechanism for concentrating and recovering dissolved boron from the liquid effluent for reuse in the plant or removal from the site. The BM system includes two concentrators, several tanks and pumps, filters and ion exchangers, and the associated piping and valves required to collect and process radioactive waste fluids from various plant systems for recycle or disposal.

The major influent to the BM system is from the letdown line in the CVC system and is the result of feed and bleed operations during plant shutdowns, startups, and dilution due to fuel burnup over core life. Other sources into the BM system consist of valve and equipment leak-offs, miscellaneous drains, and relief valve discharges. The reactor drain tank collects these discharges within the containment, while the equipment drain tank and equipment drain sump accumulate those from outside the containment. From the discharge of the collection tanks and CVC system, water is sent to the holdup tanks, where the radioactivity of the liquid is significantly reduced during storage. From the holdup tanks, water is processed through filters and ion exchangers and stored in the boric acid condensate tanks. From there the fluid is either released or reprocessed.

The section of the system including the flash tank and flash tank pumps is inactive and isolated from the rest of the system by closed valves. Use of the tank required a continuous feed of nitrogen, which created an excessive amount of gaseous waste to be stored and processed. The three-way valve at the inlet to the flash tank is positioned to bypass the tank and has no supply air or power.

Portions of the BM system that receive and store reactor coolant water discharge for decay are classified as safety-related (Safety Class 3). This includes the holdup tanks, reactor drain tank pump, equipment drain tank pump, and associated piping and isolation valves. However, as part of the licensing basis change to use the alternate source term (10 CFR 50.67), the FSAR analyses of the liquid waste system (BM system and waste management system) leak or failure (release to atmosphere) was deleted from FSAR Section 15.7.3.2. This event is no longer required by the Standard Review Plan (NUREG-0800). Therefore, the Safety Class 3 components of the BM system no longer perform a safety function in accordance with 10 CFR 54.4(a)(1).

BM system components that support the containment pressure boundary are safety-related (Safety Class 2). A BM system valve also supports the pressure boundary of the refueling water storage pool (RWSP). Other components of the system have no safety function.

In addition to the 10 CFR 54.4(a)(2) function described above, the BM system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations. A valve supporting the RWSP pressure boundary is reviewed in Section 2.3.2.2, Safety Injection.

Chemical Feed

The purpose of the chemical feed (CF) system is to feed various chemicals into the secondary system to maintain and control the pH and to control the oxygen level for the protection of the steam generator tube integrity. The CF system includes a hydrazine feed system and an ammonia feed system, designed to feed a hydrazine solution and an aqueous ammonia solution, respectively, into the secondary system. The system also includes two independent chemical feed skids generically designed to feed alternate chemicals as water chemistry technology evolves. The system consists of tanks, pumps, valves, piping, controls and indicators.

Containment Atmosphere Purge

The purpose of the containment atmosphere purge (CAP) system is to reduce the level of radioactive contamination in the containment atmosphere to permit personnel access. The CAP system consists of a containment purge air makeup unit and a separate containment purge exhaust which is connected to the exhaust portion of the reactor auxiliary building HVAC (HVR) system. The CAP system includes no fans; motive force for the purge and makeup is provided by the HVR system exhaust fans. Apart from containment isolation valves and ducting on the makeup and exhaust lines, the CAP system has no safety function. These valves also isolate the system on a high radiation signal to support the fuel handling accident analysis.

The makeup portion of the system provides air to the containment while purge operations are being conducted. Makeup air enters through a louvered damper and passes through a medium efficiency filter and an electric heating coil. The makeup air flows in series through containment isolation valves to enter the containment.

The exhaust portion of the system draws air from inlet dampers, arranged in parallel, serving the general containment area and the refueling pool area inside containment. Exhaust air passes through the inlet dampers and a series of containment purge isolation valves to the HVR system where it is filtered for removal of any radioactive particulates and radioiodines before being exhausted by HVR system exhaust fans to the plant stack.

In addition to the 10 CFR 54.4(a)(2) function described above, the CAP system has the following intended functions for 10 CFR 54.4(a)(1).

- Isolate the system on high radiation signal to support the fuel handling accident analysis.
- Support containment pressure boundary.

Components that isolate the system and also support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Decontamination Facility

The purpose of the decontamination facility (DF) is to provide locations and facilities to decontaminate equipment. Equipment decontamination areas are provided at selected locations in the plant. The DF system code includes components of the decontamination equipment. These components include rinse tanks, pumps, filters, strainers, valves, and piping.

Gaseous Waste Management

The purpose of the gaseous waste management (GWM) system is to provide for collection, storage, sampling, and discharge of potentially radioactive gaseous waste. The GWM system consists of a gas surge tank, two waste gas compressors, three gas decay tanks, and the associated piping and valves required to collect gaseous waste and allow for release through the plant stack. Waste gases enter the GWM system by way of three headers: the vent gas collection header, the containment vent header, and the gas surge header.

The vent gas collection header collects gas primarily from aerated vents of process equipment in the boric acid makeup and boron management systems, the liquid waste management system, the chemical and volume control system, and the fuel pool cooling and purification system. Because of the large volume of gas and the low activity level from the sources, the gases are routed directly to the plant stack.

Waste gases which are routed to the gas surge header and containment vent header are mainly hydrogenated, radioactive, or potentially radioactive gases from various sources throughout the plant. Gaseous wastes are generated from reactor coolant degassing operations, processing of radioactive liquid wastes, and tank purging. These gases are collected and stored for decay in the gas surge tank prior to release to the environment. The gas surge tank acts as an accumulator for the system, allowing batch processing of the waste gases.

The waste gas compressors process the gas, taking suction on the gas surge tank and discharging to a gas decay tank. The gas decay tanks collect the waste gas discharged by the waste gas compressors and store it for approximately 60 days. This allows for the decay of the shorter lived nuclides and reduces the overall activity before the gas is discharged through the plant stack.

Components of the containment vent header support the containment pressure boundary. Other GWM system components support the pressure boundary of the safety-related chemical and volume control (CVC) and the boron management (BM) system, which has no safety functions.

In addition to the 10 CFR 54.4(a)(2) function described above, the GWM system has the following intended functions for 10 CFR 54.4(a)(1).

- Support the pressure boundary of the chemical and volume control system.
- Support containment pressure boundary.

Components that support the CVC system are reviewed in Section 2.3.3.1, Chemical and Volume Control Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Hot Machine Shop and Decontamination Facility Ventilation

The purpose of the hot machine shop and decontamination facility ventilation (HVD) system is to maintain a suitable operating environment for personnel and to limit concentrations of airborne radioactivity within the areas and in the exhausted air. The ventilation supply system includes two supply air handling units, one supplying the hot machine shop and the other the decontamination facility. Each air handling unit has a medium efficiency filter, electric heating coil, chilled water cooling coil, and centrifugal fan. Two exhaust air handling units, one each for the decontamination room and hot machine shop, exhaust air using a medium efficiency filter, HEPA filter, and centrifugal fan which discharges through a pneumatically operated damper and louver.

The HVD system contains drain valves and piping located in the reactor building.

Leak Rate Testing

The purpose of the leak rate testing (LRT) system is to support integrated leak rate testing of the containment. The system includes pressure, temperature and humidity instrumentation and test connection valves on station air system containment penetrations (penetrations 63 and 65) and the H&V instrumentation penetration (penetration 53). These LRT valves form part of the containment pressure boundary.

Nonsafety-related LRT system components containing indoor air and waste water are attached to safety-related equipment and located in areas with safety-related equipment.

In addition to the 10 CFR 54.4(a)(2) function described above, the LRT system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Liquid Waste Management

The purpose of the liquid waste management (LWM) system is to collect, store, process, monitor, and release liquid wastes while ensuring that all releases of radioactive materials, both in plant and to the environment, are within applicable requirements. The system manages both radioactive and non-radioactive liquid wastes from process systems, equipment drains, and sumps.

The system includes a variety of storage and collection tanks, pumps, piping, valves, filters, and instruments and controls.

Post Accident Sampling

The purpose of the post accident sampling (PAS) system is to permit sampling of the primary coolant and safety injection sump following an accident. (Post-accident sampling of the containment atmosphere is supported by the hydrogen recombiners and analyzers (HRA) system.) Components of the PAS system code are used to collect, cool and analyze reactor coolant and safety injection sump samples. The system supports collection of diluted, undiluted, and full pressure liquid samples and gas grab samples.

The PAS system consists of accumulators, a chiller, dryers, filters, heat exchangers, pumps, piping, valves, and instrumentation and controls.

Post-accident sampling is not a safety function, and the system contains no safety-related components. Nonsafety-related PAS components containing treated water or waste water are located in areas with safety-related equipment.

Potable Water

The purpose of the potable water (PW) system is to distribute water from the St. Charles Parish Water System throughout the plant site. The system provides potable water, both hot and cold, for drinking water, sanitary services, and emergency showers and eyewash stations. The distribution system also supplies makeup water to the fire water storage tanks and to the primary water treatment plant clearwell tank.

The potable water distribution system may be used as necessary (if available) to replenish water to the wet cooling tower basins following a tornado. A hose connection in the makeup water supply to the fire water storage tanks and a portable diesel-driven pump are provided to allow makeup from the potable water system to the wet cooling tower basins. However, because the availability of the potable water supply to the site is not assured following a tornado, this is not an intended function for the potable water supply. The credited source is the Mississippi River through the circulating water system using the portable pump.

Potable water to the reactor auxiliary building is supplied via a solenoid-operated isolation valve. This valve isolates potable water to the reactor auxiliary building during a seismic event or piping rupture to prevent control room flooding. The system has no safety-related components.

Nonsafety-related components are located in areas with safety-related equipment. This includes piping and valves as well as a hot water storage tank and associated pump.

In addition to the 10 CFR 54.4(a)(2) function described above, the PW system has the following intended function for 10 CFR 50(a)(2), which is included in this review.

- Isolate potable water from the reactor auxiliary building during a seismic event or piping rupture.

Primary Makeup

The primary makeup (PMU) system provides storage and transfer capability necessary to supply demineralized water to primary plant systems including the chemical and volume control system, boron management system, reactor coolant system (reactor drain tank and quench tank), and waste management systems. The PMU system consists of a 260,000 gallon primary water storage tank (PWST) located in the yard, two full-capacity primary water pumps, and associated system valves, distribution piping, and instrumentation. PWST makeup comes from the demineralized water system. The PMU pumps take suction from the PWST to supply primary grade water to various plant loads.

The system distribution piping includes safety-related components for a containment penetration. The system has no other safety functions except to support the pressure boundary of the CVC system.

If available following a tornado, inventory from the PWST may be used to replenish the wet cooling tower basin; however, because this tank is not protected from tornado missiles, this is not an intended function for the tank. The credited source is the Mississippi River through the circulating water system.

In addition to the 10 CFR 54.4(a)(2) function described above, the PMU system has the following intended functions for 10 CFR 54.4(a)(1).

- Support the CVC system pressure boundary.
- Support containment pressure boundary.

PMU system components that support the pressure boundary of the CVC system are reviewed in Section 2.3.3.1, Chemical and Volume Control. Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Primary Sampling

The purpose of the primary sampling (PSL) system is to collect and analyze fluid and gaseous grab samples from the reactor coolant system, chemical and volume control system, safety injection system, and the primary water storage tank during all modes of operation without requiring access to the containment. The PSL takes samples and brings them to a common location in the primary sampling room PSL panel in the reactor auxiliary building for analysis. The analyses performed on the samples determine fission and corrosion product activity levels, boron concentration, residual hydrazine, silica, lithium, pH and conductivity levels, crud concentration, dissolved gas concentration, and chloride.

The PSL system includes safety-related components that form parts of the pressure boundary of the chemical and volume control system. The PSL system also includes components that are part of the containment pressure boundary. Other than the support of the safety-related system and containment pressure boundaries, the PSL system has no safety function. Safety-related components associated with safety injection (SI) system sampling are components in the SI system.

In addition to the 10 CFR 54.4(a)(2) function described above, the PSL system has the following intended functions for 10 CFR 54.4(a)(1).

- Support the safety-related pressure boundaries of sampled systems.
- Support containment pressure boundary.

The PSL system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (safety-related systems pressure boundaries) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

PSL system components that support the pressure boundary of the CVC system are reviewed in Section 2.3.3.1, Chemical and Volume Control. Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Radiation Monitoring

The radiation monitoring system consists of components in the ARM and PRM system codes.

The purpose of area radiation monitoring (ARM) components is to inform operations personnel, both locally and in the main control room, of radiation levels in areas where area radiation monitoring system detectors are located, provide warning when abnormal radiation levels occur in specific plant areas, and warn of possible equipment malfunctions. Some channels of the area radiation monitoring system provide a containment purge isolation signal and enable main control room operators to monitor radioactivity levels inside the containment. In the event of a fuel handling accident, the area radiation monitoring system provides a signal to isolate the fuel handling building and start the emergency ventilation system.

The purpose of process radiation monitoring (PRM) components is to sample, detect, measure, and record trends of radioactive concentrations in liquid process systems, ventilation systems, and airborne or liquid effluents. These components also provide alarms and automatic termination or redirection of liquid and airborne radioactive discharges. PRM components support the pressure boundary of monitored systems.

The radiation monitors are comprised mainly of EIC components, which are within the scope of license renewal by default (see Section 2.1.1). Intended functions performed by EIC components are not reviewed here. However, there are safety-related mechanical components with the ARM system code associated with containment atmosphere radiation sampling. Also, the PRM system code includes mechanical components (pumps, valves, piping, heat exchangers, dryers, and filters) to support the operation of some process monitors. These mechanical components for most of the radiation monitors are not classified as safety-related and have no safety function. However, the mechanical components that support monitoring of the containment atmosphere, plant stack effluent, and component cooling water are classified as safety-related.

The containment atmosphere radiation monitor (PRM-IR-0100Y) takes particulate, iodine and gas readings of the containment atmosphere to help detect identified or unidentified leaks in the RCS pressure boundary. While the rad monitor itself and certain components associated with the monitor are classified as safety-related, they do not perform a function in accordance with the criteria of 10 CFR 54.4(a)(1) and are therefore not within the scope of license renewal for 10 CFR 54.4(a)(1). This rad monitor is associated with a containment penetration, and the piping and valves associated with the penetration perform a safety function in accordance with the criteria of 10 CFR 54.4(a)(1).

The plant stack monitors (PRM-IRE-0100.1, -0100.2) provide indication of the activity levels of radioactive materials released to the environs, so that determination of the total release is possible. They are credited in FSAR Section 15.7.3.4 (referred to as airborne radiation monitors) for a containment purge isolation signal. Although the containment purge isolation has no protective function in accordance with IEEE Standard 279-1971, isolation of containment purge (system code CAP) is conservatively credited to support the fuel handling accident analysis. Therefore, the PRM system performs a safety function associated with the plant stack rad monitors.

The component cooling water radiation monitors provide for early detection of radioactivity leakage into normally nonradioactive systems. This is not a safety function in accordance with 10 CFR 54.4(a)(1) nor does it support a safety function (not credited in an analysis of off-site dose release). However, these components have an intended function of supporting the pressure boundary of the component cooling water system.

In addition to the 10 CFR 54.4(a)(2) function described above, the radiation monitoring system has the following intended functions for 10 CFR 54.4(a)(1).

- Support isolation of containment purge in the event of a fuel handling accident.

- Support component cooling water system pressure boundary.
- Support containment pressure boundary.

Nonsafety-related components that support dry cooling tower sumps discharge flow paths to the circulating cooling water system are reviewed in Section 2.3.3.14, Plant Drains. Components supporting the component cooling water system pressure boundary are reviewed in Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water. The plant stack monitors are included in Section 2.3.3.12, Miscellaneous HVAC. The safety-related mechanical components of the containment atmosphere radiation monitors are reviewed in Section 2.3.2.3, Containment Penetrations.

Reactor Cavity Cooling

The purpose of the reactor cavity cooling (RCC) system is to maintain the ambient steady state air temperature in the annular space between the reactor vessel and the concrete primary shield wall below the maximum design basis air temperature of the reactor cavity during normal operations. The system has no safety function.

The RCC system consists of two full-capacity axial supply fans arranged in parallel and connected to a common supply duct. Each fan is provided with a supply discharge gravity damper to prevent recirculation through the standby fan. Each axial supply fan draws cooled air from the containment cooling system ring header. The fans supply air to ventilate the annular space between the reactor vessel and primary shield wall.

Resin Waste Management

The purpose of the resin waste management (RWM) system is to collect and store spent radioactive ion exchanger resin from the various process demineralizers and to transfer resins to the portable solidification and/or dewatering system. The RWM system includes a spent resin tank, spent resin transfer pump, spent resin dewatering pump, spent resin strainers, and associated valves, piping and controls.

For NPIS penetrations 75 and 76, resin waste management system piping and valves provide flood barrier protection during a Probable Maximum Flood (PMF) event.

In addition to the 10 CFR 54.4(a)(2) function described above, the RWM system has the following intended function for 10 CFR 54.4(a)(2).

- Support NPIS flood barrier.

Components that support the NPIS flood barrier are reviewed in Section 2.3.3.14, Plant Drains.

Secondary Sampling

The purpose of the secondary sampling system is to collect steam and water samples from the secondary cycle, the makeup demineralizer, the blowdown demineralizer, condensate transfer pump discharge, and the steam generators and to bring them to a common location in the secondary lab and sampling room for analysis. Water quality analyses are performed to provide a basis for the control of the secondary cycle water chemistry and steam generator integrity. The analyses performed on the samples are appropriate to determine pH, specific and cation conductivity levels, silica, sodium, dissolved oxygen, and residual hydrazine concentrations.

The secondary sampling system includes components of the secondary sampling (SSL) system code and the constant temperature bath (CTB) system code. The CTB system components provide constant temperature cooling water used to cool secondary plant samples. The system includes coolers, pumps, a sample recovery tank, piping, valves, and instrumentation and controls.

The SSL system code includes safety-related components that support the pressure boundary of the main steam system. The SSL system code also includes components that are part of the containment pressure boundary. Other than the support of the main steam system and containment pressure boundaries, the secondary sampling system has no safety function.

In addition to the 10 CFR 54.4(a)(2) function described above, the secondary sampling system has the following intended functions for 10 CFR 54.4(a)(1).

- Support the safety-related pressure boundary of main steam system.
- Support containment pressure boundary.

The secondary sampling system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (main steam pressure boundary) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

Components that support the main steam pressure boundary are reviewed in Section 2.3.4.4, Main Steam. Components that support containment pressure boundary are reviewed in Section 2.3.2.3, Containment Penetrations.

Solid Waste Management

The purpose of the solid waste management (SWM) system is to process, package and store low-level solid radioactive wastes for subsequent shipment and offsite burial. The SWM system code includes the waste concentrate storage tank, a dewatering tank, a sodium silicate storage tank, a cement silo, pumps, and associated valves and piping. This equipment is not used. Isolation valves remain active in this system code.

For NPIS penetration 114, solid waste management piping and a valve provide flood barrier protection during a Probable Maximum Flood (PMF) event.

In addition to the 10 CFR 54.4(a)(2) function described above, the SWM system has the following intended function for 10 CFR 54.4(a)(2).

- Support NPIS flood barrier.

Components that support the NPIS flood barrier are reviewed in Section 2.3.3.14, Plant Drains.

Turbine Building Cooling Water

The purpose of the turbine building cooling water (TC) system is to provide a heat sink for power cycle equipment during normal operation and shutdown conditions. The TC system is a closed loop system which uses treated demineralized water to remove heat from the turbine auxiliaries and other components located within the turbine building. The water is circulated by two turbine cooling water pumps, and the heat removed via two turbine cooling water heat exchangers is transferred to the circulating water system. Components associated with the turbine building cooling water surge tank are located in the reactor auxiliary building.

FSAR References

The following table lists the FSAR references for systems described in this section.

System Code	System	FSAR Reference
AE	Air Evacuation	Section 10.4.2 (main condenser evacuation system)
ARR	Airborne Radioactivity Removal	Section 9.4.5.2
ANP	Annulus Negative Pressure	Section 9.4.5.8
AS	Auxiliary Steam	None

System Code	System	FSAR Reference
BM	Boron Management	Section 11.2.2.1
CF	Chemical Feed	Section 10.4.10
CAP	Containment Atmosphere Purge	Section 9.4.5.3
DF	Decontamination Facility	None
GWM	Gaseous Waste Management	Section 11.3
HVD	Hot Machine Shop and Decontamination Facility Ventilation	Section 9.4.3.6
LRT	Leak Rate Testing	Figure 3.8-3
LWM	Liquid Waste Management	Section 11.2
PAS	Post Accident Sampling	Section 9.3.8
PW	Potable Water	Section 9.2.4
PMU	Primary Makeup	Section 9.2.3
PSL	Primary Sampling	Section 9.3.2
ARM PRM	Radiation Monitoring	Section 7.6.1.5 Section 11.5 Section 12.3.4
RCC	Reactor Cavity Cooling	Section 9.4.5.6
RWM	Resin Waste Management	Section 11.4.5 (spent resin transfer system)
SSL CTB	Secondary Sampling	Section 9.3.2
SP, PME	Solid Waste Management	Section 11.4
TC	Turbine Building Cooling Water	Section 9.2.7 (turbine closed cooling water system)

Components Subject to Aging Management Review

For each safety-to-nonsafety interface, nonsafety-related components connected to safety-related components were included up to one of the following:

(1) The first seismic anchor, which is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

(2) An equivalent anchor (restraints or supports), which is defined as a boundary point that encompasses at least two supports in each of three orthogonal directions.

(3) A boundary determined using the bounding approach, which included piping beyond the safety-to-nonsafety interface up to a flexible connection or the end of a piping run (such as a vent or drain line) or up to and including a base-mounted component.

(4) An endpoint of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

For spatial interaction, auxiliary system components containing water, oil, or steam and located in spaces containing safety-related equipment are subject to aging management review in this 10 CFR 54.4(a)(2) review if not already included in another system review. Components are excluded from review if their location is such that no safety function can be impacted by component failure. If a HELB analysis assumes that nonsafety-related piping in an auxiliary system does not fail or assumes failure only at specific locations, then that piping is within the scope of license renewal per 10 CFR 54.4(a)(2). Appropriate components are subject to aging management review to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes maintaining structural integrity for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Series 2.3.3-15-x tables list the component types for auxiliary systems that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.3.2-15-x tables provide the results of the aging management review for auxiliary systems for 10 CFR 54.4(a)(2) based on potential for physical interactions.

System Code	System Name	Component Types	AMR Results
AE	Air Evacuation	Table 2.3.3-15-1	Table 3.3.2-15-1
ARR	Airborne Radioactivity Removal	Table 2.3.3-15-2	Table 3.3.2-15-2
ANP	Annulus Negative Pressure	Table 2.3.3-15-3	Table 3.3.2-15-3
AS	Auxiliary Steam	Table 2.3.3-15-4	Table 3.3.2-15-4
BAM	Boric Acid Makeup	Table 2.3.3-15-5	Table 3.3.2-15-5
BM	Boron Management	Table 2.3.3-15-6	Table 3.3.2-15-6
CVC	Chemical and Volume Control	Table 2.3.3-15-7	Table 3.3.2-15-7
CF	Chemical Feed	Table 2.3.3-15-8	Table 3.3.2-15-8
CHW, RFR, SCH, SCC	Chilled Water	Table 2.3.3-15-9	Table 3.3.2-15-9
CW	Circulating Water	Table 2.3.3-15-10	Table 3.3.2-15-10
CC	Component Cooling Water	Table 2.3.3-15-11	Table 3.3.2-15-11
IA, SA	Compressed Air	Table 2.3.3-15-12	Table 3.3.2-15-12
CAP	Containment Atmosphere Purge	Table 2.3.3-15-13	Table 3.3.2-15-13
CAR	Containment Atmosphere Release	Table 2.3.3-15-14	Table 3.3.2-15-14
CB	Containment Building	Table 2.3.3-15-15	Table 3.3.2-15-15
DF	Decontamination Facility	Table 2.3.3-15-16	Table 3.3.2-15-16
EG, EGA, EGC, EGF, EGL	Emergency Diesel Generator	Table 2.3.3-15-17	Table 3.3.2-15-17
HVF	Fuel Handling Building HVAC	Table 2.3.3-15-18	Table 3.3.2-15-18
FS	Fuel Pool Cooling and Purification	Table 2.3.3-15-19	Table 3.3.2-15-19
GWM	Gaseous Waste Management	Table 2.3.3-15-20	Table 3.3.2-15-20
HVD	Hot Machine Shop and Decontamination Facility Ventilation	Table 2.3.3-15-21	Table 3.3.2-15-21
LRT	Leak Rate Testing	Table 2.3.3-15-22	Table 3.3.2-15-22
LWM	Liquid Waste Management	Table 2.3.3-15-23	Table 3.3.2-15-23
NG	Nitrogen	Table 2.3.3-15-24	Table 3.3.2-15-24
PAS	Post Accident Sampling	Table 2.3.3-15-25	Table 3.3.2-15-25
PW	Potable Water	Table 2.3.3-15-26	Table 3.3.2-15-26

System Code	System Name	Component Types	AMR Results
PMU	Primary Makeup	Table 2.3.3-15-27	Table 3.3.2-15-27
PSL	Primary Sampling	Table 2.3.3-15-28	Table 3.3.2-15-28
ARM, PRM	Radiation Monitoring	Table 2.3.3-15-29	Table 3.3.2-15-29
HVR	Reactor Auxiliary Building HVAC	Table 2.3.3-15-30	Table 3.3.2-15-30
RCC	Reactor Cavity Cooling	Table 2.3.3-15-31	Table 3.3.2-15-31
RWM	Resin Waste Management	Table 2.3.3-15-32	Table 3.3.2-15-32
SSL, CTB	Secondary Sampling	Table 2.3.3-15-33	Table 3.3.2-15-33
SWM	Solid Waste Management	Table 2.3.3-15-34	Table 3.3.2-15-34
SP, PME	Sump Pump	Table 2.3.3-15-35	Table 3.3.2-15-35
TC	Turbine Building Cooling Water	Table 2.3.3-15-36	Table 3.3.2-15-36

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

System Code	System Name	LRA Drawings	
AE	Air Evacuation	LRA-G163	
ARR	Airborne Radioactivity Removal	LRA-G853 sh 11	
ANP	Annulus Negative Pressure	LRA-G853 sh 1	
AS	Auxiliary Steam	LRA-G164 sh 2	
BAM	Boric Acid Makeup	LRA-G168 sh 3	
BM	Boron Management	LRA-G171 sh 1 LRA-G171 sh 2 LRA-G171 sh 3	
CVC	Chemical and Volume Control	LRA-G168 sh 1 LRA-G168 sh 2	
CF	Chemical Feed	LRA-G164 sh 1 LRA-G164 sh 6 LRA-G170 sh 1	LRA-G170 sh 3 LRA-G171 sh 2

System Code	System Name	LRA Drawings
CHW, RFR, SCH, SCC	Chilled Water	LRA-G853 sh 3 LRA-G853 sh 4 LRA-G853 sh 9
CW	Circulating Water	LRA-G164 sh 5 LRA-G164 sh 6 LRA-G158 sh 2
CC	Component Cooling Water	LRA-G160 sh 1 LRA-G160 sh 2 LRA-G160 sh 3 LRA-G160 sh 4 LRA-G160 sh 5 LRA-G162 sh 1 LRA-G162 sh 3 LRA-G170 sh 6
IA, SA	Compressed Air	LRA-G152 sh 4 LRA-G152 sh 6 LRA-G152 sh 9 LRA-G157 LRA-G164 sh 6
CAP	Containment Atmosphere Purge	LRA-G853 sh 1 LRA-G853 sh 21
CAR	Containment Atmosphere Release	LRA-G853 sh 1
CB	Containment Building	None
DF	Decontamination Facility	None
EG, EGA, EGC, EGF, EGL	Emergency Diesel Generator	LRA-1564-2044 LRA-5817-9519 LRA-G164 sh 1 LRA-G164 sh 2
HVF	Fuel Handling Building HVAC	LRA-G853 sh 2
FS	Fuel Pool Cooling and Purification	LRA-G163 LRA-G169
GWM	Gaseous Waste Management	LRA-G170 sh 4 LRA-G170 sh 6
HVD	Hot Machine Shop and Decontamination Facility Ventilation	None
LRT	Leak Rate Testing	LRA-G164 sh 1 LRA-G164 sh 3

System Code	System Name	LRA Drawings
LWM	Liquid Waste Management	LRA-G170 sh 1 LRA-G170 sh 2 LRA-G170 sh 3
NG	Nitrogen	LRA-G166 sh 1 LRA-G166 sh 2 LRA-G168 sh 2
PAS	Post Accident Sampling	LRA-G162 sh 3
PW	Potable Water	None
PMU	Primary Makeup	LRA-G161 sh 2 LRA-G168 sh 2 LRA-G170 sh 3 LRA-G170 sh 5
PSL	Primary Sampling	LRA-G162 sh 1 LRA-G162 sh 5
ARM, PRM	Radiation Monitoring	LRA-G164 sh 2
HVR	Reactor Auxiliary Building HVAC	LRA-G853 sh 11 LRA-G853 sh 15 LRA-G853 sh 16 LRA-G853 sh 21
RCC	Reactor Cavity Cooling	LRA-G853 sh 1
RWM	Resin Waste Management	LRA-G168 sh 1 LRA-G170 sh 1 LRA-G170 sh 2 LRA-G170 sh 5 LRA-G171 sh 1
SSL, CTB	Secondary Sampling	LRA-G162 sh 1 LRA-G162 sh 2 LRA-G162 sh 4 LRA-G162 sh 6
SWM	Solid Waste Management	LRA-G170 sh 5
SP, PME	Sump Pump	LRA-G173 sh 2 LRA-G173 sh 3
TC	Turbine Building Cooling Water	LRA-G159 sh 2

Table 2.3.3-15-1
Air Evacuation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-2
Airborne Radioactivity Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-3
Annulus Negative Pressure System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Blower housing	Pressure boundary
Bolting	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary

Table 2.3.3-15-4
Auxiliary Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Trap	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-5
Boric Acid Makeup System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-6
Boron Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Condenser (shell)	Pressure boundary
Cooler housing	Pressure boundary
Demineralizer	Pressure boundary
Evaporator	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-7
Chemical and Volume Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Flex hose	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-8
Chemical Feed System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cylinder	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-9
Chilled Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-10
Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-11
Component Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-12
Compressed Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-13
Containment Atmosphere Purge System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary

Table 2.3.3-15-14
Containment Atmosphere Release System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Ducting	Pressure boundary

Table 2.3.3-15-15
Containment Building
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-16
Decontamination Facility
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-17
Emergency Diesel Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-18
Fuel Handling Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Blower housing	Pressure boundary
Bolting	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary
Piping	Pressure boundary

**Table 2.3.3-15-19
Fuel Pool Cooling and Purification System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-20
Gaseous Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cooler housing	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Trap	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-21
Hot Machine Shop and Decon Facility Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-22
Leak Rate Testing System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-23
Liquid Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Condenser (shell)	Pressure boundary
Cooler housing	Pressure boundary
Demineralizer	Pressure boundary
Evaporator	Pressure boundary
Filter housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-24
Nitrogen System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Trap	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-25
Post Accident Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Chiller housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-26
Potable Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-27
Primary Makeup System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-28
Primary Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flex hose	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Trap	Pressure boundary
Valve body	Pressure boundary
Vessel	Pressure boundary

Table 2.3.3-15-29
Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-30
Reactor Auxiliary Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Damper housing	Pressure boundary
Ducting	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-31
Reactor Cavity Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Blower housing	Pressure boundary
Bolting	Pressure boundary
Ducting	Pressure boundary

Table 2.3.3-15-32
Resin Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.3-15-33
Secondary Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Cooler housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-34
Solid Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-35
Sump Pump System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-15-36
Turbine Building Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

2.3.4 Steam and Power Conversion Systems

The following systems are included in this section.

- Section 2.3.4.1, Condensate Makeup and Storage
- Section 2.3.4.2, Emergency Feedwater
- Section 2.3.4.3, Main Feedwater
- Section 2.3.4.4, Main Steam
- Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

2.3.4.1 Condensate Makeup and Storage

System Description

The purpose of the condensate makeup and storage system is to make up water to, and discharge water from, the condensate system and to store and transfer demineralized water for initial fill and makeup to various normally nonradioactive systems throughout the plant. The condensate makeup and storage system includes components in system codes CMU (condensate makeup and storage system) and DW (demineralized water system). The CMU system includes two sources of condensate makeup: the safety-related condensate storage pool in the reactor/auxiliary building and the nonsafety-related condensate storage tank in the yard. The CMU system also includes component cooling water makeup pumps and a distribution subsystem for the condensate storage pool. The DW system includes the nonsafety-related demineralized water storage tank located in the yard. The condensate storage tank and demineralized water tank are provided with a nitrogen blanket to maintain the dissolved oxygen content. These tanks share a distribution subsystem comprised of pumps, piping and valves with component identification numbers that use the CC (component cooling water), CD (condensate), CMU, and DW system codes; for license renewal, these components are included with the condensate makeup and storage system review.

The condensate storage pool is the water supply for the EFW pumps. The flow path from the condensate storage pool to the EFW pumps is considered part of the condensate makeup and storage system. The condensate storage pool, component cooling water makeup pumps, and the associated distribution subsystem provide makeup to the component cooling water system. They can also distribute makeup to the emergency diesel generator jacket water standpipes, the essential chiller expansion tanks, and the fuel pool makeup fill and purification loop. The makeup supply to the spent fuel pool provides a seismic Category I makeup supply from the condensate storage pool.

The nonsafety-related condensate storage tank, demineralized water tank, condensate storage tank pumps, condensate transfer pump, hotwell transfer pump, and the associated distribution subsystem provide demineralized water to various systems and components, including the condenser hotwell, the auxiliary boiler, the chemical feed system, auxiliary feedwater pump, condensate storage pool, refueling water storage pool, and auxiliary component cooling water wet cooling towers. This subsystem also provides water to hose stations inside the reactor building. Apart from the containment pressure boundary components, the distribution subsystem from the condensate storage tank and demineralized water tank has no safety function. If available following a tornado, inventory from the condensate storage tank and demineralized water tank may be used to replenish the wet cooling tower basin; however, because these tanks are not protected from tornado missiles, this is not an intended function for the tanks. The credited source is the Mississippi River through the circulating water system.

Two nonsafety-related valves (CMU-908 and -909, fuel casket spray valve isolation and bypass) are credited as part of the flood barrier for the fuel handling building for the design basis flood.

The condensate makeup and storage system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide a source of makeup to the component cooling water system, the emergency diesel generators and the essential chilled water system.
- Provide water for the EFW pumps.
- Support containment pressure boundary.

The condensate makeup and storage system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide a makeup water supply to the spent fuel pool.
- Provide flood barrier for design basis flood.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The condensate makeup and storage system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function (EFW water supply and makeup to other safe shutdown equipment) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).
- Perform a function (EFW water supply) that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

FSAR References

- Section 9.1.3.1.e (spent fuel pool makeup)
- Section 9.2.3.2 (demineralized water)
- Section 9.2.6 (condensate storage)
- Section 10.4.9.2 (condensate storage pool)

Components Subject to Aging Management Review

Safety-related basket strainers in the condensate storage pool are reviewed in Section 2.4.2, Nuclear Plant Island Structure. Valves credited as flood barriers are reviewed in Section 2.3.3.14, Plant Drains. Components supporting the component cooling water system pressure boundary are reviewed in Section 2.3.3.3, Component Cooling and Auxiliary Component Cooling Water. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2). Remaining components are reviewed as listed below.

Table 2.3.4-1 lists the component types that require aging management review.

Table 3.4.2-1 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

- LRA-G153 sh 4
- LRA-G160 sh 6
- LRA-G161 sh 2
- LRA-G163
- LRA-G164 sh 2
- LRA-G169
- LRA-G853 sh 3

Table 2.3.4-1
Condensate Makeup and Storage System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Valve body	Pressure boundary

2.3.4.2 Emergency Feedwater

System Description

The purpose of the emergency feedwater (EFW) system is to provide cooling water to the steam generators for the removal of decay heat from the reactor during emergency situations when the main feedwater system is not available. The system can also be used during emergency situations to cooldown the reactor coolant system to the temperature and pressure required for shutdown cooling system operation. The EFW system consists of two half-capacity motor-driven pumps, a full-capacity steam turbine-driven pump, and the associated piping and valves. For license renewal, the EFW system is considered to begin at the EFW pumps. Supply to the pumps from the condensate storage pool is provided by the condensate makeup and storage system.

The three pumps take suction from a common suction header supplied by two lines from the condensate storage pool. The pumps discharge to a common supply header. Each EFW pump can be isolated by suction and discharge valves which are normally locked open. The suction and discharge lines of the pumps are normally cross-connected by locked-open manual valves. Water from the discharge header is then delivered to each main feedwater header through an arrangement of control and isolation valves. The discharge of the EFW pumps can supply either or both steam generators.

Steam for the emergency feedwater pump turbine is supplied from either or both steam generators, taken upstream of the main steam isolation valves. The wet cooling tower basins of the auxiliary component cooling water system are available to the EFW pumps as an alternate source of water if the condensate storage pool becomes depleted.

The EFW system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide cooling water to one or both steam generators for the removal of decay heat from the reactor during emergency situations when the main feedwater system is not available.
- Support containment pressure boundary.

The EFW system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The EFW system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).
- Perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

FSAR References

Section 10.4.9

Components Subject to Aging Management Review

The emergency feedwater pump turbine and EFW components that support the lube oil cooler for the emergency feedwater pump turbine governor and governor valve servo are reviewed in Section 2.3.4.4, Main Steam. Components with an EFW component identification in the flow path from the condensate storage pool to the EFW pumps are reviewed in Section 2.3.4.1, Condensate Makeup and Storage. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2). Remaining components are reviewed as listed below.

Table 2.3.4-2 lists the component types that require aging management review.

Table 3.4.2-2 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G153 sh 4

LRA-G160 sh 6

Table 2.3.4-2
Emergency Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Coil	Heat transfer Pressure boundary
Heat exchanger (housing)	Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.4.3 Main Feedwater

System Description

The purpose of the main feedwater (FW) system is to supply water from the condensate system to the steam generators at the proper pressure, temperature and flow rate to maintain steam generator water level under all plant operating conditions. The FW system components are arranged in two parallel paths that provide feedwater to each steam generator. The FW system consists of two turbine-driven pumps, three high-pressure heaters, regulating valves, isolation valves, and other miscellaneous valves and piping. A control system operates the regulating valves and controls feed pump speed to maintain steam generator water level.

The condensate system supplies water to the suction of the feedwater pumps. Each feedwater pump discharges to the combined discharge header, which feeds three parallel high-pressure feedwater heaters. The heaters discharge to a single header that splits to supply each steam generator. Following the split in the header, a flow venturi measures feedwater flow to each steam generator. Each steam generator feedwater supply line has one main feedwater regulating valve, one start-up feedwater regulating valve, and one motor-operated feedwater regulating bypass valve. Downstream of the regulating valves, the feedwater flows through a check valve, main feedwater isolation valve, and another check valve before going to the steam generator. The emergency feedwater (EFW) system ties into the feedwater lines downstream of the main feedwater isolation valves.

When required, automatic isolation of the steam generators is provided by the main feedwater isolation valves with backup from the main feedwater regulating valves and start-up feedwater regulating valves.

The portion of the FW system from the check valves located outside containment to the steam generator feed nozzles is part of the containment pressure boundary.

The FW system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide automatic isolation of the feedwater flow to the steam generators.
- Support the delivery of emergency feedwater to the steam generators.
- Support containment pressure boundary.

The FW system has the following intended functions for 10 CFR 54.4(a)(2).

- Provide backup automatic isolation of the feedwater flow to the steam generators.

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The FW system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function (EFW system support, FW isolation) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

- Perform a function (EFW system support) that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

FSAR References

Section 10.4.7

Components Subject to Aging Management Review

Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2). Remaining components are reviewed as listed below.

Table 2.3.4-3 lists the component types that require aging management review.

Table 3.4.2-3 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G151 sh 1

LRA-G153 sh 4

Table 2.3.4-3
Main Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.4.4 Main Steam

System Description

This review includes the main steam system and supporting functions performed by the steam generator blowdown system and the reheat steam system.

Main Steam

The purpose of the main steam (MS) system is to convey steam from the steam generators to the high pressure turbine and to other auxiliary equipment for power generation. During full-power operating conditions, main steam normally supplies the high pressure main turbine, the moisture separator reheaters, and the auxiliary steam system. During reduced power conditions, main steam replaces or supplements steam to the feedwater pump turbines and the gland seal steam system. The main steam system is the source of steam for the turbine-driven emergency feedwater pump. The MS system provides for overpressure protection for the steam generators and main steam lines, discharges steam to the condenser or atmosphere when the main turbine is unavailable, and provides for isolation of the main steam lines when required.

The main steam system conveys steam from the steam generators to the high pressure turbine through the containment vessel in two main steam lines. Downstream of the steam generators, each main steam line has a flow element, six safety relief valves, a power-operated atmospheric relief valve, and a main steam isolation valve (MSIV). A steam supply line to the emergency feedwater pump turbine branches from each main steam line, upstream of the MSIVs.

Downstream of the MSIVs, the main steam lines supply the high pressure turbine, the gland seal system, the auxiliary steam system, and a common main steam header. Lines from the main steam header supply the moisture separator reheaters, the steam generator feedwater pump turbines, and the steam bypass system. The steam bypass system, comprised of components in the MS system code, includes six valves connected to the main steam header that discharge steam directly to the main condenser.

In the event of a steam line break upstream of an MSIV and a failure of the MSIV to close on the unaffected steam generator, blowdown of the unaffected steam generator is prevented by the closure of the nonsafety-related turbine stop valves and turbine bypass valves that serve as an acceptable backup for this accident.

The MS system has the following intended functions for 10 CFR 54.4(a)(1).

- Isolate the SGs from the non-safety portions of the MS system during emergency conditions by automatic closure of the MSIVs.

- Dissipate heat generated and accumulated in the nuclear steam supply system (NSSS) to atmosphere during emergency conditions by operation of the main steam safety valves and/or the atmospheric dump valves until shutdown cooling can be initiated.
- Provide main steam line and steam generator overpressure protection.
- Provide redundant flow paths for the steam supply to emergency feedwater pump turbine.
- Support containment pressure boundary.

The MS system has the following intended functions for 10 CFR 54.4(a)(2).

- Prevent blowdown of the unaffected steam generator during a main steam line break event when the fault is upstream of one MSIV and the single failure is the failure of the other steam generator MSIV to close.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The MS system has the following intended functions for 10 CFR 54.4(a)(3).

- Perform a function (relief valves, MSIVs, support EFW) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).
- Perform a function (support EFW) that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63).

Blowdown

The purpose of the steam generator blowdown (BD) system is to control the chemical composition of water in the steam generator shells. The BD system removes water from the steam generators to maintain water chemistry. Two blowdown lines, one from each steam generator, exit the containment through their own penetrations. Two air-operated containment isolation valves, one inside and one outside, are located in each of the lines exiting containment. Downstream of the containment isolation valves, blowdown water pressure and temperature are reduced, and the water is processed through mixed bed demineralizers or processed as waste. Clean water is returned to the secondary system.

The system includes tanks, heat exchangers, pumps, demineralizers, piping, valves, flow elements, and instrumentation. The portion of the BD system from the steam generators to and including the outside containment isolation valves comprises an extension of the steam generator boundary. The remainder of the BD system has no safety function.

The BD system has the following intended functions for 10 CFR 54.4(a)(1).

- Support the steam generator pressure boundary.
- Support containment pressure boundary.

The BD system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The BD system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (blowdown isolation) that demonstrates compliance with the Commission’s regulations for fire protection (10 CFR 50.48).

Reheat Steam

The purpose of the reheat steam (RS) system is to reheat and dry the high pressure turbine exhaust by means of the moisture separator reheaters and to provide the reheated steam to the low pressure turbines. Two horizontal axis, cylindrical shell combined moisture separator and reheater assemblies are installed in the steam lines connecting the high pressure and low pressure turbines.

Steam from the high pressure turbine passes up through the moisture separators. The water separated from the steam is drained from the moisture separator-reheaters to the moisture separator reheater shell drain tanks, which drain into the intermediate pressure feedwater heaters. The steam then flows through the reheater section of the moisture separator-reheater, where it is heated by a steam tube bundle. Main steam is supplied to this tube bundle from the main steam line. The condensate from this tube bundle is drained to the moisture separator reheater drain collector tank, which drains into the high pressure feedwater heaters. Steam flow from the moisture separator reheaters is then directed to the low pressure turbines. A separate outlet located on Moisture Separator Reheater B supplies steam flow for normal operation of the feedwater pump turbines.

In the event of a steam line break upstream of an MSIV and a failure of the MSIV to close on the unaffected steam generator, blowdown of the unaffected steam generator is prevented by the closure of the nonsafety-related turbine stop valves and turbine bypass valves that serve as an acceptable backup for this accident. Part of this flow path is isolated by two RS valves to the steam generator feedwater pump turbines.

The RS system has no intended functions for 10 CFR 54.4(a)(1).

The RS system has the following intended function for 10 CFR 54.4(a)(2).

- Support preventing blowdown of the unaffected steam generator during a main steam line break event when the fault is upstream of one MSIV and the single failure is the failure of the other steam generator MSIV to close.

The RS system has no intended functions for 10 CFR 54.4(a)(3).

FSAR References

Section 10.3 (main steam supply system)

Section 10.4.4 (steam bypass system, also referred to as turbine bypass system)

Section 10.4.8 (steam generator blowdown)

Section 10.2.2.2.4 (reheat steam)

Components Subject to Aging Management Review

The nitrogen chambers in the MSIV actuators are reviewed in Section 2.3.3.11, Nitrogen. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2). Remaining components are reviewed as listed below.

Table 2.3.4-4 lists the component types that require aging management review.

Table 3.4.2-4 provides the results of the aging management review.

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

LRA-G151 sh 1	LRA-G162 sh 2
LRA-G151 sh 2	LRA-G164 sh 5
LRA-G151 sh 4	LRA-G165 sh 3

Table 2.3.4-4
Main Steam System
Components Subject to Aging Management Review

Component Type	Intended Function
Bearing housing	Pressure boundary
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Flow control Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Heat transfer Pressure boundary
Nozzle	Flow control Pressure boundary
Orifice	Flow control Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

2.3.4.5 Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

As discussed in Sections 2.1.1.2 and 2.1.2.1.2, systems within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) interact with safety-related systems in one of two ways: functional or physical. A functional failure is one where the failure of a nonsafety-related SSC to perform its function impacts a safety function. A physical failure is one where a safety function is impacted by the loss of structural or mechanical integrity of an SSC.

Functional Failure

Functional failures of nonsafety-related SSCs which could impact a safety function are identified with the individual system's evaluation and are not discussed in this section.

Physical Failure

This section summarizes the scoping and screening results for steam and power conversion (S&PC) systems based on 10 CFR 54.4(a)(2) because of the potential for physical interactions with safety-related equipment. Physical failures may be related to structural support or to spatial interaction.

Nonsafety-Related Systems or Components Directly Connected to Safety-Related Systems (Structural Support)

At Waterford 3, certain components and piping outside the safety class pressure boundary must be structurally sound to maintain the pressure boundary integrity of safety class piping. Systems containing such nonsafety-related SSCs directly connected to safety-related SSCs (typically piping systems) are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

Nonsafety-Related Systems or Components with the Potential for Spatial Interaction with Safety-Related Systems or Components

The following modes of spatial interaction are described in Sections 2.1.1.1 and 2.1.2.1.2.

Physical Impact or Flooding

The evaluation of interactions due to physical impact or flooding resulted in the inclusion of structures and structural components. Structures and structural components are reviewed in Section 2.4, Scoping and Screening Results: Structures.

Pipe Whip, Jet Impingement, or Harsh Environments

Systems containing nonsafety-related high energy lines that can affect safety-related equipment are included in the review for the criterion of 10 CFR 54.4(a)(2). Where this criterion affected S&PC systems, those systems are within the scope of license renewal per 10 CFR 54.4(a)(2).

Leakage or Spray

Nonsafety-related system components or nonsafety-related portions of safety-related systems containing water, oil, or steam are considered within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) if such components are located in a space containing safety-related SSCs. S&PC systems meeting this criterion are within the scope of license renewal per 10 CFR 54.4(a)(2).

The following S&PC systems, described in the referenced sections, are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions.

System Number	System Name	Section Describing System
BD	Blowdown	Section 2.3.4.4, Main Steam
CD	Condensate	Section 2.3.4.5, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
CMU DW	Condensate Makeup and Storage	Section 2.3.4.1, Condensate Makeup and Storage
EFW	Emergency Feedwater	Section 2.3.4.2, Emergency Feedwater
FW	Main Feedwater	Section 2.3.4.3, Main Feedwater
MS	Main Steam	Section 2.3.4.4, Main Steam

System Description

The following system within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) is not described elsewhere in the application.

Condensate

The purpose of the condensate (CD) system is to supply purified and preheated water to the feedwater pumps via the condensate polishers and low-pressure and intermediate-pressure feedwater heaters. The system also supplies water to the steam generator blowdown system, feedwater pump glands, and condenser exhaust hood spray.

The major components of the condensate system are the main condenser, condensate pumps, gland steam condenser, low-pressure feedwater heaters, and intermediate-pressure feedwater heaters. Apart from the condensate polisher system components, the condensate system includes the components in the feedwater flow path from the main condenser hotwell up to the feedwater pump suction.

Condensate flow begins at the main condenser hotwell. The main condenser functions as the heat sink for the low-pressure turbines and feedwater pump turbines exhaust, main steam system bypass steam, and miscellaneous flows, drains and vents during normal operation. The condenser also provides de-aeration of the condensate. The pumps discharge water through the polishing demineralizers. A portion of the flow then passes through the tubes of the gland steam condenser, which receives the exhaust steam from the glands of the main turbine and the feedwater pump turbines and condenses it back into water. After the gland steam condenser, the condensate flows through three parallel strings of low-pressure feedwater heaters and then through the three parallel strings of intermediate-pressure feedwater heaters. Water exits the intermediate-pressure heaters and is combined with the discharge of the heater drain pumps (system FHD). The total water flow is sent to the combined suction of the steam generator feed pumps.

The CD system code is used for safety-related piping that supports the flow path from the condensate storage pool to the emergency feedwater pumps. Safety-related piping using the CD system code also supports the condensate makeup and storage fill line to the condensate storage pool and the refueling water storage pool; the fill lines are pressure boundaries for the pools. This safety-related piping is reviewed for license renewal as part of the condensate makeup and storage system (Section 2.3.4.1). The CD system code has no other mechanical components that are safety-related.

The CD system has no intended functions for 10 CFR 54.4(a)(1).

The CD system has the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

The CD system has no intended functions for 10 CFR 54.4(a)(3).

FSAR References

Section 10.4.7

Components Subject to Aging Management Review

For each safety-to-nonsafety interface, nonsafety-related components connected to safety-related components were included up to one of the following:

(1) The first seismic anchor, which is defined as a device or structure that ensures that forces and moments are restrained in three orthogonal directions.

(2) An equivalent anchor (restraints or supports), which is defined as a boundary point that encompasses at least two supports in each of three orthogonal directions.

(3) A boundary determined using the bounding approach, which included piping beyond the safety-to-nonsafety interface up to a flexible connection or the end of a piping run (such as a vent or drain line) or up to and including a base-mounted component.

(4) An endpoint of a plant-specific piping design analysis to ensure that forces and moments are restrained in three orthogonal directions.

For spatial interaction, S&PC system components containing water, oil, or steam and located in spaces containing safety-related equipment are subject to aging management review in this 54.4(a)(2) review if not already included in another system review. Components are excluded from review if their location is such that no safety function can be impacted by component failure. If a HELB analysis assumes that nonsafety-related piping in an S&PC system does not fail or assumes failure only at specific locations, then that piping is within the scope of license renewal per 10 CFR 54.4(a)(2). Appropriate components are subject to aging management review to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

For component types included under 10 CFR 54.4(a)(2), the intended function of pressure boundary includes maintaining structural integrity for components that are included for nonsafety-related SSCs directly connected to safety-related SSCs.

Series 2.3.4-5-x tables list the component types for S&PC systems that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.4.2-5-x tables provide the results of the aging management review for S&PC systems for 10 CFR 54.4(a)(2) based on potential for physical interactions.

System Number	System	Component Types	AMR Results
BD	Blowdown	Table 2.3.4-5-1	Table 3.4.2-5-1
CD	Condensate	Table 2.3.4-5-2	Table 3.4.2-5-2
CMU DW	Condensate Makeup and Storage	Table 2.3.4-5-3	Table 3.4.2-5-3
EFW	Emergency Feedwater	Table 2.3.4-5-4	Table 3.4.2-5-4
FW	Main Feedwater	Table 2.3.4-5-5	Table 3.4.2-5-5
MS	Main Steam	Table 2.3.4-5-6	Table 3.4.2-5-6

License Renewal Drawings

Additional details for components subject to aging management review are provided in the following license renewal drawings.

System Code	System	LRA Drawings
BD	Blowdown	LRA-G164 sh 5 LRA-G164 sh 6 LRA-G173 sh 1
CD	Condensate	LRA-G164 sh 2 LRA-G164 sh 6
CMU DW	Condensate Makeup and Storage	LRA-G160 sh 1 LRA-G161 sh 2 LRA-G162 sh 3 LRA-G163 LRA-G853 sh 9
EFW	Emergency Feedwater	LRA-G153 sh 4
FW	Main Feedwater	LRA-G153 sh 4
MS	Main Steam	LRA-G151 sh 1 LRA-G151 sh 4 LRA-G165 sh 3

Table 2.3.4-5-1
Blowdown System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.4-5-2
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Valve body	Pressure boundary

Table 2.3.4-5-3
Condensate Makeup and Storage System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Valve body	Pressure boundary

Table 2.3.4-5-4
Emergency Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Valve body	Pressure boundary

Table 2.3.4-5-5
Main Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary

Table 2.3.4-5-6
Main Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Module[a]	Support for criterion (a)(1) equipment
Piping	Pressure boundary
Strainer housing	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

a. The MSIV hydraulic pump module provides lube oil that is used to maintain the MSIVs open.

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The following structures and structural components are within the scope of license renewal.

- Section 2.4.1, Reactor Building
- Section 2.4.2, Nuclear Plant Island Structure
- Section 2.4.3, Turbine Building and Other Structures
- Section 2.4.4, Bulk Commodities

2.4.1 Reactor Building

Description

The reactor building is a Category I structure comprised of a free-standing steel containment vessel and a containment internal structure. The steel containment vessel is enclosed inside the shield building, which is a reinforced concrete structure. The reactor building, and all other seismic Category I structures are housed in a common reinforced concrete structure called the nuclear plant island structure (NPIS).

The purpose of the reactor building is to support and protect the enclosed vital mechanical and electrical equipment, including the reactor vessel, the reactor coolant system, the steam generators, pressurizer, auxiliary and engineered safety features systems required for safe operation and shutdown of the reactor. The safety function of the reactor building is to limit the release of radioactive fission products following an accident thereby limiting the dose to the public and control room operators. The reactor building structure also provides physical support for itself, the reactor coolant system, engineered safety features, and other systems and equipment located within the structure. In addition, the reactor building supports the plant stack and also serves as a reliable final barrier against the escape of fission products to ensure the leakage limits are not exceeded and fission product releases are within 10 CFR 20 during normal plant operation and 10 CFR 50.67 during the postulated design basis accidents.

The exterior walls and dome of the concrete shield building provide protection for the reactor vessel and all other safety-related system, structures and components inside the steel containment from missiles and natural phenomena. The carbon steel components and the concrete inside the steel containment vessel are credited as structural heat sinks in the energy absorption analysis during a loss of coolant accident. The reactor building and its associated structures contains jib cranes and monorails used for maintenance related activities. During normal operations this equipment is stored and restrained in a designated storage position. An annular space is provided between the walls and domes of the steel containment vessel and concrete shield building to permit in-service inspections.

A more detailed description of the reactor building is provided below.

Steel Containment Vessel

The steel containment vessel is a vertical upright cylinder, all welded steel pressure vessel with hemispherical dome and ellipsoidal bottom which houses the reactor pressure vessel, the reactor coolant piping, the pressurizer, the quench tank, the reactor coolant pumps, the steam generators, and the safety injection tanks. It is completely enclosed by the reinforced concrete shield building. The steel containment vessel ellipsoidal bottom is totally encased in concrete and founded on the concrete base and common foundation mat with the shield building. A circular bridge crane or polar crane is used inside containment to facilitate maintenance activities during refueling. The polar crane girder support plates are welded to the shell liner. Except for some miscellaneous platform framing and some minor seismic restraints, no major floor framing or seismic restraint supports are attached to the shell liner. An equipment hatch constructed of carbon steel has been provided to enable passage of large equipment and components from the outside into the steel containment vessel during plant shutdown. The equipment hatch is a welded steel assembly, with a double gasket flanged and bolted cover. Additionally, two carbon steel personnel airlocks provide personnel access from the reactor auxiliary building into the steel containment vessel. The airlocks are equipped with double doors that are interlocked to prevent simultaneous opening of the two doors. Each door is designed with a double gasket to ensure a high degree of leak tightness.

In addition to the equipment hatch and personnel airlocks, containment penetrations include piping penetrations (including the fuel transfer tube penetration) and electrical penetrations. Containment penetration assemblies form openings through the shield building and steel containment vessel for passage of electrical conductors, HVAC ducts, and process system piping, including the fuel transfer tube penetration. The function of the containment piping penetration assemblies is to provide for passage of process, service, sampling and/or instrumentation pipe lines (or in the case of the fuel transfer assembly, new or spent fuel) into the steel containment vessel, while maintaining the desired containment integrity and providing a leak-tight seal with adequate provisions for movement between the piping components and the containment structure during operation. The safety-related containment integrity function is shared by the steel containment vessel, shield building, containment isolation system and penetration assemblies. Some assemblies, such as guard pipes, also function as barriers between high energy process systems and the containment annulus, preventing pressurization of the annulus in the event of a high energy line break. Bellows expansion joints serve to provide for the passage of process pipes into the containment while maintaining a leak tight seal between them and to absorb relative movements (thermal and/or seismic) between the containment vessel, shield building and/or the process piping. Bellows assemblies located between the containment vessel and the flued head are designated as primary bellows. Those bellows assemblies located between the shield wall and the flued head are designated as secondary bellows.

The steel containment vessel contains one seismic Category I safety injection system (SIS) sump and one containment sump. The SIS sump is a large collecting reservoir designed to provide an adequate supply of water to the containment spray system and SIS during the recirculation mode. The SIS sump is located at the lowest floor elevation inside containment exclusive of the reactor vessel cavity and containment sump. The containment sump, which is located at the lowest point within the reactor cavity, collects liquid discharges of low purity (non-reactor grade) wastes from equipment, tanks, miscellaneous leak-off points, and floor drainage. Two sump pumps discharge the sump contents to the waste tanks through a radiation monitor located outside the containment.

Trisodium phosphate dodecahydrate (TSP) is stored in the containment in multiple containers located on the -11' MSL elevation. The containers are constructed of stainless steel angles, stainless steel plates at top and bottom, and stainless steel wire mesh on the four vertical sides. The containers are all welded construction with a hinged top plate to allow for TSP surveillance inspection. The function of the TSP is to raise the SIS sump pH following a design basis loss of coolant accident.

Containment Internal Structure

The containment internal structures components and framing are seismic Category I and are enclosed completely by the steel containment vessel. The concrete components are the primary and secondary shield walls, a refueling canal, enclosures around the pressurizer and the regenerative heat exchanger. The internal steel structures are the reactor vessel, steam generators and the reactor coolant pump support framing along with pipe, duct and tray restraints, operating floor framing, and miscellaneous platform framing.

Concrete floor fill, placed in the bottom of the steel containment vessel support the internal structures. The concrete floor fill, concrete primary and secondary shield walls and the concrete enclosures form compartments within which the entire reactor coolant system is located. The primary and secondary shield walls and other containment internal structures provide protection from internal missiles. The purpose of the internal structures is to provide structural support and radiation shielding for the reactor coolant system, auxiliary systems, and engineered safety features.

Around the reactor pressure vessel is a primary shield wall. This wall is a rectangular reinforced concrete structure and provides support for the reactor vessel through a ring girder. A secondary shield wall consisting of two half-cylindrical reinforced concrete walls, enclose the steam generators, reactor coolant pumps and reactor coolant piping, located on each side of the reactor vessel. A concrete pedestal resting upon the concrete floor fill provide support for the steam generators.

The pressurizer and regenerative heat exchanger enclosures consist of reinforced concrete walls, supporting floor, and a roof forming compartments abutting the secondary shield wall. Vent openings in the pressurizer enclosure walls and supporting floor slab provides for pressure relief. The secondary shield wall and adjacent columns located on the concrete fill support both walls. The enclosures provide biological shielding during normal operation. For the pressurizer enclosure the walls also serve to contain potential missiles.

A watertight permanent cavity seal ring (PCSR) is installed between the reactor vessel flange and floor of the refueling pool specifically for the refueling operation. The PCSR has multiple hatches, which can be opened to provide access for activities within the reactor cavity. These hatches also allow for ventilation between the reactor cavity and the refueling cavity. During plant outages removable hatch covers are installed to provide a watertight seal. Double O-ring seals act against the PCSR and the removable hatches. A welded flexure ring is provided on the reactor vessel seal ledge and the refuel pool embedment ring. The flexure ring design permits relative displacement (due to a safe shutdown earthquake) between the vessel flange and the pool floor while still maintaining a watertight seal. To ensure a leak tight seal, the seals for the removable hatches are tested after installation and before flooding the pool.

The refueling canal connects the reactor cavity and the spent fuel storage pool of the fuel handling building through the fuel transfer tube. The refueling cavity concrete provides a support structure for the operating floor, intermediate platform and the missile shield above the reactor pressure vessel. The refueling cavity will be flooded with borated water during refueling. Therefore, the refueling canal reinforced concrete walls are provided with a stainless steel liner completely covering the interior face of the cavity for the purpose of rendering the refueling cavity completely watertight. A refueling machine is the principal means of transporting fuel assemblies between the reactor cavity and the fuel transfer tube. The steel platform travels on steel tracks along each side of the reactor cavity above the refuel canal pool.

Shield Building

The shield building is a free standing structure without any structural ties between it and the steel containment vessel above the foundation level. Concrete fill placed in the bottom of the structure provides support of the steel containment. The shield building, supported on the common foundation of the NPIS, is a reinforced concrete structure constructed as a right cylinder with a shallow dome roof. Conventional reinforcing steel bars were used throughout the structure.

Clearance between the bottom face of the concrete shield building dome and the top of the steel containment dome allows for access for inspection and to assure freedom of movement of the steel containment. An annulus airlock is provided for access from the outside environment to the shield building annular space. A shield building maintenance hatch is provided for equipment access to the steel containment vessel. A seismic Category I concrete filled door is provided for this maintenance hatch at the exterior face of the shield building to protect this access opening. The door is double sealed to prevent in-leakage to the containment annulus space. The function of the shield building is to protect the steel containment vessel from external missiles and the annular space provided between the interior face of the concrete shield building walls and the outside face of the steel containment vessel provides the means for collecting and diluting any leakage.

The reactor building has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide physical support, shelter and protection for safety-related equipment within the scope of license renewal. (10 CFR 54.4(a)(1))

- Provide primary containment to limit the release of radioactive materials so that offsite doses from a postulated design basis accident are below the guideline values of 10 CFR 50.67. (10 CFR 54.4(a)(1))

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected. (10 CFR 54.4(a)(2))

- Provide shelter, support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The reactor building houses equipment credited in the safe shutdown analysis for fire protection (10 CFR 50.48), for station blackout (10 CFR 50.63) and for anticipated transients without scram (10 CFR 50.62). (10 CFR 54.4(a)(3))

FSAR References

Section 3.8.1	Figure 1.2-17	Figure 3.8-31
Section 3.8.2	Figure 1.2-18	Figure 3.8-40
Section 3.8.3	Figure 1.2-19	Figure 3.8-44
Section 3.8.4	Figure 1.2-20	
Section 6.1.3	Figure 1.2-21	
Section 6.2.2.2.2.1	Figure 1.2-22	
Section 9.3.3.2.1.2		

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect plant equipment including system components, piping, and electrical conductors. Structural commodities that are unique to the reactor building are included in this review. Those that are common to in-scope systems and structures (anchors, embedments, pipe and equipment supports, instrument panels and racks, cable trays, conduits, etc.) are reviewed in Section 2.4.4, Bulk Commodities.

Table 2.4-1 lists the component types that require aging management review.

Table 3.5.2-1 provides the results of the aging management review.

Table 2.4-1
Reactor Building
Components Subject to Aging Management Review

Component	Intended Function
Steel and Other Metals	
Crane: rails and structural girders	Heat sink Support for Criterion (a)(2) equipment
Crane: structural girders	Heat sink Support for Criterion (a)(2) equipment
Penetration bellows	Enclosure protection Heat sink Pressure boundary Support for Criterion (a)(1) equipment
Penetration sleeves	Enclosure protection Heat sink Pressure boundary Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Plant stack	Support for Criterion (a)(1) equipment
Steel components: annulus access lock	Fire barrier Missile barrier Pressure boundary Support for Criterion (a)(1) equipment
Steel components: beams, columns and plates	Enclosure protection Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Steel components: impingement barriers	Heat sink Missile barrier Support for Criterion (a)(1) equipment
Steel components: jib cranes	Heat sink Support for Criterion (a)(2) equipment
Steel components: liner plate	Heat sink Support for Criterion (a)(1) equipment

**Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review**

Component	Intended Function
Steel components: maintenance hatch shield door	Fire barrier Missile barrier Pressure boundary Support for Criterion (a)(1) equipment
Steel components: monorails	Heat sink Support for Criterion (a)(2) equipment
Steel components: personnel airlock, escape lock, construction hatch, maintenance hatch	Enclosure protection Fire barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges, and closure mechanisms	Pressure boundary Support for Criterion (a)(1) equipment
Steel components: pressure retaining bolting	Heat sink Pressure boundary Support for Criterion (a)(1) equipment
Steel component: reactor missile shield	Heat sink Missile barrier Support for Criterion (a)(1) equipment
Steel component: reactor cavity seal ring and hatches	Flood barrier Heat sink Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Steel components: refueling maintenance structure	Heat sink Support for Criterion (a)(2) equipment
Steel components: refueling platform equipment assembly and rails	Heat sink Support for Criterion (a)(2) equipment
Steel elements (accessible areas): liner; liner anchors; integral attachments (steel containment vessel)	Enclosure protection Heat sink Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment

**Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review**

Component	Intended Function
Steel elements (inaccessible areas): liner; liner anchors; integral attachments (steel containment vessel)	Enclosure protection Heat sink Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Steel elements: SIS sump screens/strainers	Heat sink Support for Criterion (a)(1) equipment
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the steam generators, pressurizer, and reactor coolant pumps)	Heat sink Support for Criterion (a)(1) equipment
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the reactor pressure vessel)	Heat sink Support for Criterion (a)(1) equipment
Concrete	
Beams, columns, floor slabs and interior walls (primary and secondary shield walls; pressurizer compartments; reactor cavity; and missile shield and barriers)	Enclosure protection Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): shield building; all	Enclosure protection Missile barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): refueling canal	Enclosure protection Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review

Component	Intended Function
Concrete (accessible areas): shield building wall and dome; interior and above-grade exterior	Enclosure protection Missile barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): refueling canal	Enclosure protection Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): shield building; all	Enclosure protection Missile barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Other Materials	
Compressible seals for annulus lock; escape lock; personnel lock; maintenance hatch	Pressure boundary Support for Criterion (a)(1) equipment
Containment penetration seals and sealant	Pressure boundary Support for Criterion (a)(1) equipment
Inflatable seal for maintenance hatch shielding door	Pressure boundary Support for Criterion (a)(1) equipment
Moisture barrier	Enclosure protection Support for Criterion (a)(1) equipment
Service Level I coatings	Support for Criterion (a)(2) equipment

2.4.2 Nuclear Plant Island Structure

Description

The nuclear plant island structure contains the component cooling water system structure, fuel handling building, reactor auxiliary building, and reactor building. The reactor building is addressed separately in Section 2.4.1.

Nuclear Plant Island Structure (NPIS)

The purpose of the NPIS is to provide a common structure for the reactor building, reactor auxiliary building, fuel handling building, and component cooling water system structure as well as providing a common foundation mat for these structures.

The nuclear plant island structure is a seismic Category I structure supported on a continuous reinforced concrete foundation mat. The NPIS is a reinforced concrete box structure with solid exterior walls. All exterior doors and penetrations below elevation +30 feet which lead to areas containing safety-related equipment are watertight. The structure is founded on a continuous reinforced concrete foundation mat resting on a compacted shell filter blanket, which is supported by the Pleistocene sediments. Double water stops are provided at the construction joints in the foundation mat, while single water stops for vertical construction joints in the exterior walls are provided up to elevation +30 feet. In addition, stainless steel plates are provided at the bottom of the mat, where sumps and manholes are located. The cylindrical wall of the shield building is directly founded on the common mat as well as the steel containment vessel, which is supported on the concrete fill. To assure proper contact between the containment and the concrete fill, the interface is grouted with epoxy between the concrete fill and the bottom of the vessel through channels left by pulled tubing. The primary shield wall, secondary shield wall and refueling canal of the internal structure are also founded on concrete fill supported by the NPIS.

The nuclear plant island structure has the following intended function for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provides physical support, shelter, and protection for safety-related systems, structures, and components within the scope of license renewal. (10 CFR 54.4(a)(1))

- Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). (10 CFR 54.4(a)(2))

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commissions' regulations for fire protection (10 CFR 50.48) and station blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

Component Cooling Water System Structure

The purpose of the component cooling water system (CCWS) structure is to provide a source of cooling water for safe shutdown of the plant.

The CCWS structure is located on the east and west side of the reactor building. The structure comprises two independent sets of dry and wet cooling towers in conjunction with water stored in the wet cooling tower basins. Each set of dry and wet cooling towers consists of reinforced concrete box structures supported on the common mat foundation of the nuclear plant island structure. An access to the equipment hatch of the reactor building is provided in the west CCWS structure. The motor control centers and the transformers for the dry and wet cooling towers are protected from tornado missiles by grating capable of withstanding tornado missile impact. The purpose of the component cooling water system structure is to house the CCWS, which services all reactor auxiliaries and serves as the ultimate heat sink. The ultimate heat sink is defined as the dry cooling towers, the wet cooling towers, and the water stored in the wet cooling tower basins.

Dry Cooling Tower

The dry cooling towers consist of two separate and independent forced draft cooling towers. Each dry cooling tower is subdivided into five reinforced concrete chambers and each chamber is equipped with three fans supported on the walls at different levels in each of these chambers. The cooling coils of three of the dry cooling tower chambers of each tower are protected from tornado missiles by grating located above the coils. Dry cooling tower fans and motors are located below grade, and protected from tornado missiles by building walls and/or access platforms.

Wet Cooling Towers

The wet cooling towers consist of two separate independent multi-fan cooling units. Each wet cooling tower has two reinforced concrete chambers. The wet cooling towers utilize fill section consisting of a large number of cross fluted, vertically oriented stainless steel sheets. These sheets are attached at their sides to stainless steel frames which in turn are supported by structural steel beams. The drift eliminator for the cooling tower is located above the water distribution pipes. Drift eliminators are constructed of vertical corrugated slats of stainless steel sheets. The fan deck of the wet cooling towers is constructed of a series of stainless steel panels and is supported by structural steel beams. These beams also support the fan-motor drive assembly and the fan stacks. Galvanized steel access hatches, located in the fan deck, provide means of access to the interior of the tower.

The component cooling water system structure has the following intended functions for 10 CFR 54.4(a)(1) (a)(2) and (a)(3).

- Provide physical support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. (10 CFR 54.4(a)(1))
- Provide a source of cooling water for safe shutdown of the plant. The structure is designed to provide a reliable source of cooling water and is the ultimate heat sink. (10 CFR 54.4(a)(1))
- Provide physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). (10 CFR 54.4(a)(2))
- Provide physical support, shelter, and protection for safety-related systems, structures, and components and nonsafety-related systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commissions' regulations for fire protection (10 CFR 50.48) and for station blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

Fuel Handling Building

The purpose of the fuel handling building is to provide housing for a spent fuel storage pool, spent fuel pool pumps, spent fuel pool heat exchanger, backup fuel pool heat exchanger, spent fuel pool purification pump and heating and ventilating equipment.

The fuel handling building is located immediately north of the reactor building. The building is a reinforced concrete structure supported on the common NPIS mat foundation. Above the common foundation mat the building is structurally separated from the reactor building at all levels. The building's exterior walls, floors, and interior partitions provide plant personnel with biological radiation shielding and protection for the surrounding equipment. The spent fuel pool, within the structure, is a stainless steel-lined reinforced concrete tank structure that provides space for storage of spent fuel, spent fuel cask and miscellaneous items. The spent fuel cask storage area is located adjacent to (on the west side of) the spent fuel pool. Stainless steel liners are placed directly against the concrete to form the sides of the three regions (spent fuel pool, spent fuel cask storage area and refueling canal). The stainless steel floor liner plate is supported on a steel beam grillage, which in turn is supported by the concrete base. The entire steel grillage is grouted to the underside of the floor liner plate. A leak detection system is provided to monitor the pool liner welds. The system consists of a network of stainless steel angles attached to the outside of the pool liner walls and floor by means of seal welds. A bridge crane for the handling of spent fuel casks and for maintenance activities runs on rails supported on a reinforced concrete frame above the operating floor. Multiple bulkhead gates accommodate fuel handling, spent fuel cask handling and provide flood protection. Additionally, the removable watertight gates provide separation of the pool storage areas. The removable gates contain inflatable elastomer seals that provide a watertight seal between the gate and the pool wall liner face. In the fuel handling building area there is one removable flood-protected gate (Gate 3A) welded shut. This gate is located by the spent fuel cask decontamination area and is provided as a flood barrier. The refueling canal is located adjacent to (on the west side of) the spent fuel cask storage area. The refueling canal connects the reactor cavity and the spent fuel storage pool of the fuel handling building through the fuel transfer tube. The transfer tube consists of a stainless steel pipe installed inside the carbon steel penetration connecting the refuel cavity and the spent fuel pool. The inner pipe acts as the transfer tube and is fitted with a double-gasketed blind flange in the refueling cavity. Expansion bellows are provided to compensate for differential movement between the two pipes and between the outer pipe and other structures. The handling of the spent fuel in the spent fuel pool is accomplished with the spent fuel machine which runs on rails along the top of the spent fuel pool structure. Monorail hoists and a smaller crane service the equipment and new fuel storage area.

The fuel handling building has the following intended functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3).

- Provides physical support, shelter, and protection for safety-related systems, structures, and components within the scope of license renewal. (10 CFR 54.4(a)(1))

- Maintain integrity of safety and nonsafety-related components such that safety functions are not affected by providing biological shielding and a watertight compartment in which to carry out the refueling process. (10 CFR 54.4(a)(2))

- Provide shelter, support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The fuel handling building houses equipment credited in the safe shutdown analysis for fire protection (10 CFR 50.48). (10 CFR 54.4(a)(3)).

Reactor Auxiliary Building

The purpose of the reactor auxiliary building is to provide plant personnel with the necessary biological radiation shielding, protect the equipment inside from the effects of adverse conditions and provide protection to the cable and piping penetration areas of the reactor building.

The reactor auxiliary building is a seismic Category I structure located immediately south of the reactor building. The reactor auxiliary building houses the waste treatment facilities, engineered safeguards systems, switchgear, laboratories, diesel generators and main control room. The reactor auxiliary building is a multistory reinforced concrete structure with an interior floor construction of concrete beams and girders supported by reinforced concrete columns founded on the common NPIS mat foundation. Above the common mat foundation, the building is structurally separated from the reactor building at all levels. Within the waste treatment facility is a seismic Category I cask handling bridge crane, for handling miscellaneous radioactive waste. The reactor auxiliary building also houses two seismic Category I fuel oil storage tanks for supplying two diesel generators. The tanks are located in separated enclosed vaults located on opposite sides of the reactor auxiliary building. These enclosures are fire barriers consisting of concrete walls, floors, and ceilings. The condensate storage pool (CSP) and refueling water storage pool (RWSP) are also contained as an integral part of the reactor auxiliary building. The CSP and RWSP are located in the north side of the reactor auxiliary building in separate concrete vaults lined with stainless steel. The pools are vented to the atmosphere and contain vacuum and vortex breakers.

The reactor auxiliary building has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide physical support, shelter, and protection for safety-related systems, structures, and components. (10 CFR 54.4(a)(1))
- Provide physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). (10 CFR 54.4(a)(2))
- Provide shelter, support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The reactor auxiliary building houses equipment credited in the safe shutdown analysis, fire protection (10 CFR 50.48), and for station blackout (10 CFR 50.63) and environmental qualification (10 CFR 50.49). (10 CFR 54.4(a)(3))

FSAR References

Nuclear Plant Island Structure

Section 2.4.1.1	Figure 3.8-1	Table 3.2-1
Section 3.8.5.1	Figure 3.8-31	
	Figure 3.8-45	

Component Cooling Water Structure

Section 3.8.4.1.4	Figure 1.2-24	Table 3.2-1
Section 9.2.2.2.1	Figure 1.2-25	
Section 9.2.5.2		

Fuel Handling Building

Section 3.4.1	Figure 1.2-15
Section 3.8.3.1.3	Figure 1.2-16

Section 3.8.4.1.3

Section 9.1.2.2

Section 9.1.4.2.2.4

Reactor Auxiliary Building

Section 3.8.4.1.2 Figure 3.8-42

Section 9.5.1.1.3

Section 9.5.1

Section 10.4.9

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect plant equipment including system components, piping, and electrical conductors. Structural commodities that are unique to the NPIS structure are included in this review. Those that are common to in-scope systems and structures (anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits, etc.) are reviewed in Section 2.4.4, Bulk Commodities.

Table 2.4-2 lists the component types that require aging management review.

Table 3.5.2-2 provides the results of the aging management review.

Table 2.4-2
Nuclear Plant Island Structure
Components Subject to Aging Management Review

Component	Intended Function
Steel and Other Metals	
Control room ceiling support system	Support for Criterion (a)(2) equipment
Cooling tower fill/mist eliminators	Heat sink Support for Criterion (a)(1) equipment
Cranes: rails	Support for Criterion (a)(2) equipment
Cranes: structural girders	Support for Criterion (a)(2) equipment
Steel components: all structural steel	Enclosure protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Steel components: fuel pool gate	Flood barrier Heat sink Support for Criterion (a)(1) equipment
Steel components: fuel pool liner plate	Heat sink Support for Criterion (a)(1) equipment
Steel components: CSP liner plate	Enclosure protection Heat sink Support for Criterion (a)(1) equipment
Steel components: RWSP liner plate	Enclosure protection Heat sink Support for Criterion (a)(1) equipment
Steel components: monorails	Support for Criterion (a)(2) equipment
Steel components: vortex breakers/ screens/ strainers	Enclosure protection Support for Criterion (a)(1) equipment

**Table 2.4-2 (Continued)
Nuclear Plant Island Structure
Components Subject to Aging Management Review**

Component	Intended Function
Concrete	
Beams, columns, floor slabs and pipe chase	Enclosure protection Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): all	Enclosure protection Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): below-grade exterior; foundation	Enclosure protection Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): interior and above-grade exterior	Enclosure protection Flood barrier Heat sink Missile barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-2 (Continued)
Nuclear Plant Island Structure
Components Subject to Aging Management Review

Component	Intended Function
Concrete (accessible areas): NPIS exterior above- and below-grade; foundation	Enclosure protection Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): all	Enclosure protection Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): exterior above- and below-grade; foundation	Enclosure protection Flood barrier Heat sink Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Masonry walls	Enclosure protection Fire barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Roof slabs	Enclosure protection Missile barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment

2.4.3 Turbine Building and Other Structures

Description

The following structures are included in this review.

- Turbine Building
- Other Structures
  - Battery House, 230kV Switchyard
  - Control House, 230kV Switchyard
  - Fire Pump House
  - Fire Water Storage Tank Foundations
  - Manholes, Handholes and Duct Banks
  - Transformer and Switchyard Support Structures and Foundations

Turbine Building

The purpose of the turbine building is to provide support and housing for the turbine-generator and associated auxiliaries.

The turbine building is adjacent to and south of the auxiliary building. The main generator is located on the turbine generator pedestal located at the operating floor level. The lower levels of the turbine building contain the turbine generator auxiliary equipment and the nonsafety-related medium voltage switchgear. The turbine building also houses the auxiliary medium voltage switchgear through which offsite or preferred power from the unit auxiliary or start-up transformers is distributed to the nonsafety-related loads and to the safety-related onsite power system. The turbine building houses no components identified as performing a safety function in accordance with 10 CFR 54.4(a)(1). To ensure that its structural integrity is maintained and that it will not affect 10 CFR 54.4(a)(1) structures, the turbine building is included in the scope of license renewal for 10 CFR 54.4(a)(2).

The turbine building consists of reinforced concrete foundations, floor slabs, masonry block walls and metal siding up to the operating floor level. Above the turbine building operating floor the area is open to the atmosphere. Portions of the exterior walls on the lower level consist of structural steel framing and metal siding. The lower superstructure also supports the turbine building gantry crane. Interior walls are masonry block and reinforced concrete designed to provide fire protection as required to protect plant personnel and equipment. The turbine pedestal is a reinforced concrete structure supported on a separate foundation from the turbine building foundation mat.

The turbine building has no intended function for 10 CFR 54.4(a)(1).

The turbine building has the following intended function for 10 CFR 54.4(a)(2) and (a)(3).

- Maintain structural integrity of nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). (10 CFR 54.4(a)(2))

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulations for station blackout (10 CFR 50.63) and for fire protection (10 CFR 50.48). (10 CFR 54.4(a)(3))

Other Structures

Battery House, 230kV Switchyard

The purpose of the battery house is to provide a protected area for the switchyard batteries in support of station blackout.

The battery house, 230kV switchyard, is a nonsafety-related structure separated from safety-related systems, structures, and components such that its failure would not impact a safety function. The battery house is a prefabricated metal building supported on a reinforced concrete foundation.

The battery house, 230kV switchyard, has no intended functions for 10 CFR 54.4(a)(1) and (a)(2).

The battery house, 230kV switchyard, has the following intended functions for 10 CFR 54.4(a)(3).

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission’s regulation for Station Blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

Control House, 230kV Switchyard

The purpose of the control house is to provide a protected area for the relay panels which control commodities within the switchyard.

The control house, 230kV switchyard, is a nonsafety-related structure separated from safety-related systems, structures, and components such that its failure would not impact a safety function. The control house is a prefabricated metal building supported on a reinforced concrete foundation.

The control house, 230kV switchyard, has no intended functions for 10 CFR 54.4(a)(1) and (a)(2).

The control house, 230kV switchyard, has the following intended functions for 10 CFR 54.4(a)(3).

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for station blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

Fire Pump House

The purpose of the fire pump house is to provide space for three horizontal centrifugal fire pumps (one motor driven and two diesel driven) and a jockey pump for fire main pressure maintenance and shelter for the security diesel.

The fire pump house, located south of the demineralized water storage tank, is a nonsafety-related structure separated from safety-related systems, structures, and components such that its failure would not impact a safety function. The fire pump house is a prefabricated metal building with structural steel framing and built-up roofing with exterior walls consisting of galvanized steel siding. The interior walls are of concrete block construction. The entire structure is supported on a reinforced concrete foundation supported on wooden piles driven into the subgrade. Three-hour fire barriers consisting of concrete block walls separate fire pumps, located in cubicles within the structure from each other. The pumps take their suction from two vertical ground level water storage tanks located south of the structure.

The fire pump house has no intended functions for 10 CFR 54.4(a)(1) and (a)(2).

The fire pump house has the following intended functions for 10 CFR 54.4(a)(3).

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for fire protection (10 CFR 50.48) and station blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

Fire Water Storage Tank Foundations

The purpose of the fire water storage tank foundations are to provide structural support for two fire water storage tanks.

The fire water storage tank foundations are individual foundations located adjacent to and south of the fire pump house and consists of a mat foundation constructed of reinforced concrete supported on concrete piles with steel pipe casings driven into the subgrade. The fire water storage tank foundations are nonsafety-related structures separated from safety-related systems, structures, and components such that its failure would not impact a safety function.

The fire water storage tank foundations have no intended functions for 10 CFR 54.4(a)(1) and (a)(2).

The fire water storage tank foundations have the following intended functions for 10 CFR 54.4(a)(3).

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commissions' regulations for fire protection (10 CFR 50.48). (10 CFR 54.4(a)(3))

Manholes, Handholes and Duct Banks

The purpose of manholes, handholes and duct banks are to provide structural support, shelter and protection to systems, structures, and components that are relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission's regulated events and are housed within these structures during normal plant operation, and during and following postulated design basis accidents.

Manholes and handholes consist of reinforced concrete rectangular box structures buried underground with a reinforced concrete panel on top or incorporated as part of the NPIS basemat. The manholes have an opening and a cover to allow access. There are no Class IE manholes located on the NPIS. The remaining manholes are located in the yard and are not identified as Class IE, but support a license renewal intended function.

In some instances, adjacent to each manhole is a handhole structure, which is physically independent of the manhole structure but it does become part of the underground duct as it ties into it on both sides of the manhole structure. These handholes provide access to communication cables located within the duct run.

Manholes, handholes and duct banks allow underground routing of cables and some piping. Redundant trains are utilized as necessary to meet site conditions. This redundancy is provided as either entirely separate trains or designed with separating, reinforced concrete walls between the trains.

Duct banks comprise multiple raceways in an excavated trench in the yard that are encased in concrete and then backfilled with soil or engineered compacted backfill. The duct banks are used to route cables between structures and switchyard areas. Duct banks that are buried shallow in the yard may be provided with a reinforced concrete protection slab that is cast over the duct bank.

These structures have no intended function for 10 CFR 54.4(a)(1).

These structures have the following intended function for 10 CFR 54.4(a)(2) and (a)(3).

- Provides physical support, shelter, and protection for nonsafety-related systems, structures, and components whose failure could prevent satisfactory accomplishment of function(s) identified for 10 CFR 54.4(a)(1). (10 CFR 54.4(a)(2))
- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commissions' regulations for fire protection (10 CFR 50.48) and station blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

Transformer and Switchyard Support Structures and Foundations

The purpose of transformer and switchyard support structures and foundations is to provide structural support to systems, structures, and components that are relied on in safety analysis or plant evaluations to perform a function that demonstrates compliance with the Commission's regulation for station blackout, specifically those necessary to recover offsite power following a station blackout.

The transformer and switchyard support structures and foundations are located in the switching station and 230kV switchyard. The switching station is located adjacent to and south of the turbine building. The 230kV switchyard is located an additional distance south of the turbine building.

The structures that provide physical support to the switching station and 230kV switchyard components in the station blackout offsite power recovery path include the transformer foundations and foundations for the associated switchyard breakers, switchyard bus, switchyard towers, cable duct banks, and cable trenches. The transformer yard foundations are reinforced concrete pedestals that are supported by a reinforced concrete spread footing at grade or below grade. Structural steel members support the electrical components necessary for the electrical distribution system in the switchyards and are supported by the reinforced concrete pedestals. Transmission and pull-off towers are steel tower structures supported on reinforced concrete pier foundations. Therefore, the transformers and supporting structures are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(3). The transformer and switchyard support structures include the transformer and breaker foundations and supporting steel.

The transformer and switchyard support structures and foundations have no intended functions for (10 CFR 54.4(a)(1) or (a)(2).

The transformer and switchyard support structures and foundations have the following intended function for 10 CFR 54.4(a)(3).

- Provides physical support, shelter, and protection for systems, structures, and components relied upon in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63). (10 CFR 54.4(a)(3))

FSAR References

Turbine Building

None

Other Structures

Battery House, Control House, Manholes and Duct Banks

None

Fire Pump House

Section 9.5.1.2.2

Section 9.5.1.3

Transformer and Switchyard Support Structures and Foundations

Section 1.2.2.4	Figure 8.1-4
Section 8.2 (system function)	Figure 8.1-5
Section 8.2.1	
Section 8.2.1.3	

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect plant equipment including system components, piping, and electrical conductors. Structural commodities that are unique to the turbine building and other structures are included in this review. Those that are common to in-scope systems and structures (anchors, embedments, equipment supports, instrument panels, racks, cable trays, and conduits, etc.) are reviewed in Section 2.4.4, Bulk Commodities.

Table 2.4-3 lists the component types that require aging management review.

Table 3.5.2-3 provides the results of the aging management review.

Table 2.4-3
Turbine Building and Other Structures
Components Subject to Aging Management Review

Component	Intended Function
Steel and Other Metals	
Cranes: rails and structural girders	Support for Criterion (a)(2) equipment
Steel components: all structural steel	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Steel components: metal siding	Enclosure protection Support for Criterion (a)(2) equipment
Steel components: roof decking or floor decking	Enclosure protection Fire barrier
Steel piles	Support for Criterion (a)(3) equipment
Transmission tower, angle tower, pull-off tower	Support for Criterion (a)(3) equipment
Concrete	
Beams, columns and floor slabs	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): all	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): below-grade exterior; foundation	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): interior and above- grade exterior	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): exterior above- and below-grade; foundation	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): all	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-3 (Continued)
Turbine Building and Other Structures
Components Subject to Aging Management Review

Component	Intended Function
Concrete (inaccessible areas): exterior above- and below-grade; foundation	Enclosure protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Duct banks	Enclosure Protection Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Manholes and handholes	Enclosure protection Fire barrier Flood barrier Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Masonry walls	Enclosure protection Fire barrier Support for Criterion (a)(2) equipment
Other Materials	
Wooden piles	Support for Criterion (a)(2) equipment

2.4.4 Bulk Commodities

Description

Bulk commodities subject to aging management review are structural components or commodities that perform or support intended functions of in-scope systems, structures and components (SSCs). Bulk commodities unique to a specific structure are included in the review for that structure (Sections 2.4.1, 2.4.2, and 2.4.3). Bulk commodities common to in-scope SSCs (e.g., concrete embedments and anchors, bolted connections/bolting, component supports, cable trays, compressible joints and seals, conduit, decking, doors [including air locks and bulkhead doors], electrical panels and enclosures, hatches/plugs, instrument panels and racks, miscellaneous steel, racks, piping and equipment supports, tube track supports) are addressed in this review.

Bulk commodities evaluated in this section are designed to support both safety-related and nonsafety-related equipment during normal and accident conditions in the event of external events (tornadoes, earthquakes, floods, missiles) and internal events (LOCA, pipe breaks).

Bulk commodities are structural components that support the various intended functions performed by the structures in which they are located. These functions for 10 CFR 54.4(a)(1), (a)(2), and (a)(3) include the following.

- Provide support, shelter and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. 10 CFR 54.4(a)(1)

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected. 10 CFR 54.4(a)(2)

- Provide support and protection for equipment credited in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48), for environmental qualification (10 CFR 50.49), for anticipated transients without scram (10 CFR 50.62), and for station blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

Insulation may have the specific intended functions of (1) maintaining local area temperatures within design limits or (2) maintaining integrity such that falling insulation does not damage safety-related equipment.

FSAR References

None

Components Subject to Aging Management Review

Bulk commodities subject to aging management review are structural components or commodities that perform or support intended functions of in-scope SSCs. Bulk commodities unique to a specific structure are addressed in the aging management review for that structure. Bulk commodities common to in-scope SSCs (anchors, embedments, pipe and equipment supports, instrument panels and racks, cable trays, conduits, etc.), as well as seismic II/I supports, are included in this evaluation. Insulation is subject to aging management review if it performs an intended function as described above.

Table 2.4-4 lists the component types that require aging management review.

Table 3.5.2-4 provides the results of the aging management review.

Table 2.4-4
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
Steel and Other Metals	
Anchorage/embedments	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Cable tray	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduit	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Constant and variable load spring hangers; guides; stops (Supports for ASME Class 1, 2 and 3 piping and components)	Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Doors	Enclosure protection Flood barrier Missile barrier Pressure boundary
Fire doors	Fire barrier Support for Criterion (a)(3) equipment
Fire hose reels	Support for Criterion (a)(3) equipment
Fire protection components: miscellaneous steel, including framing steel, curbs, vents and louvers, radiant energy shields, tray covers	Fire barrier Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Manways, hatches, manhole covers and hatch covers	Enclosure protection Flood barrier Missile barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Mirror insulation	Support for Criterion (a)(2) equipment
Missile shields	Enclosure protection Missile barrier

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc.)	Enclosure protection Flood barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Penetration seals (end caps)	Enclosure protection Fire barrier Flood barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Penetration sleeves (mechanical/electrical not penetrating PC boundary)	Enclosure protection Fire barrier Flood barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	Enclosure protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Tube track	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Supports for ASME Class 1, 2, 3 piping and components (constant and variable load spring hangers; guides; stops)	Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Support members; welds; bolted connections; support anchorage to building structure	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Bolted Connections	
Anchor bolts	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
High-strength structural bolting (supports for ASME Class 1, 2, and 3 piping and components	Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Structural bolting; structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc.)	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Structural bolting	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete	
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Equipment pads/foundations	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Curbs	Flood barrier Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Manways, hatches/plugs, manhole covers and hatch covers	Fire barrier Flood barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Missile shields	Missile barrier
Structural fire barriers, walls, ceilings, floor slabs, curbs, dikes	Fire barrier
Support pedestals	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
Other Materials	
Compressible joints and seals	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Fire stops	Fire barrier
Fire wrap	Fire barrier
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	Insulation Support for Criterion (a)(2) equipment
Penetration seals	Enclosure protection Fire barrier Flood barrier Pressure boundary Support for Criterion (a)(2) equipment
Roof membranes	Enclosure protection Support for Criterion (a)(2) equipment
Seals and gaskets (doors, manways and hatches)	Flood barrier Pressure boundary Support for Criterion (a)(1) equipment
Vibration isolators	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

2.5 SCOPING AND SCREENING RESULTS: ELECTRICAL AND INSTRUMENTATION AND CONTROL SYSTEMS

Description

As stated in Section 2.1.1, plant electrical and instrumentation and control (I&C) systems are included in the scope of license renewal as are electrical and I&C components in mechanical systems. The default inclusion of plant electrical and I&C systems in the scope of license renewal is the bounding approach used for the scoping of electrical systems.

The basic philosophy used in the electrical and I&C components IPA is that components are included in the review unless specifically screened out. When used with the plant spaces approach, this method eliminates the need for unique identification of individual components and specific component locations. This assures components are not improperly excluded from an aging management review.

The electrical and I&C IPA began by grouping the total population of components into commodity groups. The commodity groups include similar electrical and I&C components with common characteristics. Component level intended functions of the commodity groups were identified. During the IPA screening process, commodity groups and specific plant systems were eliminated from further review if they did not perform or support an intended function.

In addition to the plant electrical systems, certain switchyard components used to restore offsite power following a station blackout (SBO) were conservatively included within the scope of license renewal even though those components are not relied on in safety analyses or plant evaluations to perform a function that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63). The April 1, 2002, SBO guidance letter[1] and NUREG-1800 Section 2.5.2.1.1 provide scoping guidance to include equipment needed for off-site power recovery, which includes equipment not explicitly required for compliance with 10 CFR 50.63.

LRA Drawing LRA-G285 depicts the electrical interconnection between Waterford 3 and the offsite transmission network. LRA Drawing LRA-G285 identifies major components or commodities associated with off-site power recovery following SBO. The highlighted portions depict the components in the SBO recovery path that are subject to aging management review. Components in the off-site power circuits that are not highlighted have no intended function for license renewal and thus are not subject to aging management review.

1. NRC to NEI, “Staff Guidance on Scoping of Equipment Relied on to Meet the Requirements of the Station Blackout (SBO) Rule (10 CFR 50.63) for License Renewal (10 CFR 54.4(a)(3)),” letter dated April 1, 2002 (ISG-02). ADAMS accession number ML020920464.

FSAR References

Additional details for electrical systems and commodities can be found in FSAR Chapters 7 and 8.

Scoping Boundaries

Plant electrical and I&C systems are included in the scope of license renewal as are electrical and I&C components in mechanical systems.

Waterford 3 preferred (offsite) power is from the 230 kV switchyard via two physically and electrically independent circuits via overhead transmission lines to the switching station and then to the startup transformers. The startup transformers supply power to the nonsafety-related buses (3A2 and 3B2). The nonsafety-related buses (3A2 and 3B2) supply power to the safety-related buses (3A3-S and 3B3-S). The ESF buses 3A3-S and 3B3-S may also receive power from the two diesel generators, should the preferred power from buses 3A2 or 3B2 be unavailable. All safety-related loads receive power from these two buses. Waterford 3 takes no credit for backfeed through the main transformers as an offsite power source.

The offsite power source required to support SBO recovery actions is the source from the 230 kV switchyard supplying the startup transformers. The path for offsite power recovery includes two 230 kV switchyard circuit breakers feeding each startup transformer, the circuit breaker-to-transformer and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures.

Steel transmission towers and foundations, structures housing switchyard batteries, and structures supporting breakers, disconnects, transformers, transmission conductors, and switchyard bus utilized in the 230-kV off-site power recovery paths are evaluated in Section 2.4, Scoping and Screening Results: Structures.

Commodity Groups Subject to AMR

As discussed in Section 2.1.2.3.1, Waterford 3 passive electrical commodity groups correspond to two of the passive commodity groups identified in NEI 95-10:

- High voltage insulators.
- Cables and connections, bus, electrical portions of electrical and I&C penetration assemblies, fuse holders outside of cabinets of active electrical components.

The commodity group cables, connections, bus, electrical portions of electrical and I&C penetration assemblies, and fuse holders outside of cabinets of active electrical components is further subdivided into the following.

- Cable connections (metallic parts).
- Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements.
- Electrical cables and connections subject to 10 CFR 50.49 EQ requirements.[2]
- Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits.
- Electrical and I&C penetration cables and connections not subject to 10 CFR 50.49 EQ requirements.[3]
- Fuse holders – insulation material.
- Fuse holders – metallic clamp.[4]
- Inaccessible power ($\geq$ 400 V) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements.
- Metal enclosed bus – bus / connections.
- Metal enclosed bus – enclosures assemblies (elastomers, external surfaces).
- Metal enclosed bus – insulation / insulators.
- Switchyard bus and connections.
- Transmission conductors and connections.
- Uninsulated ground conductors.[5]

Commodity Groups Not Subject to AMR

Electrical and I&C Penetration Assemblies

All Waterford 3 electrical and I&C penetration assemblies are in the EQ program (10 CFR 50.49). Waterford 3 electrical and I&C penetration assemblies in the EQ program are subject to replacement based on their qualified life, so they are not subject to aging management review. Non-EQ cables and connections to electrical and I&C penetrations are evaluated in the insulated cable and connection commodity group.

Fuse Holders – Metallic Clamp

A review of Waterford 3 documents (e.g., drawings, procedures, FSAR, Waterford 3 Equipment Database (Asset Suite) functional location list, and electrical design basis documents) identified fuse holders. No circuits with an LR intended function with fuse holders were identified needing

2. Waterford 3 electrical cables and connections subject to 10 CFR 50.49 EQ requirements are not subject to aging management review (STAMR) since the components are subject to replacement based on qualified life.
3. All Waterford 3 electrical and I&C penetration assemblies are in the EQ Program (10 CFR 50.49). Waterford 3 EIC penetration assemblies in the EQ Program are not STAMR since the components are subject to replacement based on qualified life.
4. Waterford 3 fuse holders (metallic clamp) are part of an active component and are not STAMR.
5. Waterford 3 uninsulated ground conductors limit equipment damage in the event of a circuit failure, but do not perform a license renewal intended function.

further evaluation. From reviewing the fuses and associated drawings, a determination was made that each fuse holder was part of an active component.

Uninsulated Ground Conductors

A review of the Waterford 3 FSAR did not identify a license renewal intended function for uninsulated ground conductors. These components are not safety-related and are not credited for mitigation of regulated events. Industry and plant-specific operating experience for uninsulated ground conductors does not indicate credible failure modes that would adversely affect an intended function; therefore, credible uninsulated ground conductor failures that could prevent satisfactory accomplishment of safety functions are hypothetical. As discussed in Section 2.1.3.1.2 of NUREG-1800 and Section III.c(iii) of the Statements of Consideration (60FR22467), hypothetical failures that are not part of the current licensing basis and have not been previously experienced are not required to be considered for license renewal scoping.

Table 2.5-1 lists the component types that require aging management review.

Table 3.6.2-1 provides the results of the aging management review.

Table 2.5-1
Electrical and Instrumentation and Control Systems
Components Subject to Aging Management Review

Structure and/or Component/Commodity	Intended Function
Cable connections (metallic parts)	Conducts electricity
Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) not subject to 10 CFR 50.49 EQ requirements	Insulation (electrical)
Insulation material for electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	Insulation (electrical)
Fuse holders (not part of active equipment): insulation material	Insulation (electrical)
Fuse holders (not part of active equipment): metallic clamps	Conducts electricity
High voltage insulators (for SBO recovery)	Insulation (electrical)
Conductor insulation for inaccessible power cables ($\geq$ 400 V) not subject to 10 CFR 50.49 EQ requirements	Insulation (electrical)
Metal enclosed bus: bus/connections	Conducts electricity
Metal enclosed bus: enclosure assemblies	Conducts electricity
Metal enclosed bus: insulation/insulators	Insulation (electrical)
Switchyard bus and connections (for SBO recovery)	Conducts electricity
Transmission conductors and connectors (for SBO recovery)	Conducts electricity
Connector contacts for electrical connectors exposed to borated water leakage	Conducts electricity

3.0 AGING MANAGEMENT REVIEW RESULTS

This section provides the results of the aging management review (AMR) for structures and components identified in Section 2 as subject to aging management review. Tables 3.0-1, 3.0-2, and 3.0-3 provide descriptions of the mechanical, structural, and electrical service environments, respectively, used in the AMRs to determine aging effects requiring management.

Results of the AMRs are presented in the following two table types.

- **Table 3.x.1** where

  3 indicates the table pertaining to a Section 3 aging management review.

  x indicates the table number from NUREG-1800 (Ref. 3.0-1).

  1 indicates that this is the first table type in Section 3.x.

For example, in the reactor coolant system section, this is Table 3.1.1, and in the engineered safety features section, this is Table 3.2.1. For ease of discussion, these table types will hereafter be referred to as "Table 1." These tables are derived from the corresponding tables in NUREG-1800 and present summary information from the AMRs.

- **Table 3.x.2-y** where

  3 indicates the application section number.

  x indicates the table number from NUREG-1800.

  2 indicates that this is the second table type in Section 3.x.

  y indicates the system table number.

For example, within the reactor coolant system section, the AMR results for the reactor vessel are presented in Table 3.1.2-1, and the results for the reactor vessel internals are in Table 3.1.2-2. In the engineered safety features section, the containment spray system results are presented in Table 3.2.2-1, and the safety injection system is in Table 3.2.2-2. For ease of discussion, these table types will hereafter be referred to as "Table 2." These tables present the results of the AMRs.

TABLE DESCRIPTION

Table 1

The purpose of a Table 1 is to provide a summary comparison of how the WF3 AMR results align with the corresponding table of NUREG-1800. These tables are essentially the same as Tables 3.1-1 through 3.6-1 provided in NUREG-1800 as amended by applicable Interim Staff Guidance documents, with the following exceptions.

- The “ID” (identification) column is labeled "Item Number" and the number has been expanded to include the table number.
- The "Type" column has been deleted. Items applicable to BWRs only are noted as such.
- The "Rev 2 Item" and “Rev 1 Item” columns have been replaced by a "Discussion" column.

The "Item Number" column provides a means to cross-reference to Table 1 from the Table 2s.

Information in the following columns of Table 1 is taken directly from NUREG-1800.

- Component
- Aging Effect/Mechanism
- Aging Management Programs
- Further Evaluation Recommended

Further information is provided in the "Discussion" column. The Discussion column explains, in summary, how the WF3 evaluations align with NUREG-1800 and NUREG-1801 (Ref. 3.0-2). The following are examples of information that might be contained within this column:

- Any "Further Evaluation Recommended" information or reference to the location of that information.
- The name of a plant-specific program being used.
- Exceptions to the NUREG-1800 and NUREG-1801 assumptions.
- A discussion of how the line item is consistent with the corresponding line item in NUREG-1800, when it may not be intuitively obvious.
- A discussion of how the line item is different from the corresponding line item in NUREG-1800, when it may appear to be consistent.

Table 2

Table 2s provide the results of the aging management reviews for those structures and components identified in Section 2 as being subject to aging management review. There is a Table 2 for each aging management review within a system group. For example, the engineered safety features system group contains tables specific to the containment spray system, safety injection system, and containment penetrations.

Table 2s also provide a comparison of the AMR results with the AMR results in NUREG-1801. Comparison to NUREG-1801 is performed by considering the component type, material, environment, aging effect requiring management, and aging management program (AMP) listed in each Table 2 line item to determine the degree of consistency with an appropriate NUREG-1801 line item, if one exists. The comparison is documented in columns 7, 8, and 9, as discussed below.

Each Table 2 consists of the following nine columns.

Component Type

Column 1 identifies the component types from Section 2 of this application that are subject to aging management review, with the addition of insulated piping components.

The term "piping" in component lists includes pipe and pipe fittings (such as elbows, flued heads, reducers, tees, etc.). The term “Insulated piping components” may include insulated indoor tanks with capacity less than or equal to 100,000 gallons.

Intended Function

Column 2 identifies the license renewal intended functions (using abbreviations where necessary) for the listed component types. Definitions and abbreviations of intended functions are listed in Table 2.0-1 in Section 2.

Material

Column 3 lists the particular materials of construction for the component type being evaluated.

Environment

Column 4 lists the environment to which the component types are exposed. Internal and external service environments are indicated using (int) or (ext), respectively. A description of these environments is provided in Tables 3.0-1, 3.0-2, and 3.0-3 for mechanical, structural, and electrical components, respectively.

Aging Effect Requiring Management

Column 5 lists the aging effects requiring management for material and environment combinations for each component type.

Aging Management Programs (AMP)

Column 6 lists the programs used to manage the aging effects requiring management.

NUREG-1801 Item

Each combination of the following factors listed in Table 2 is compared to NUREG-1801 to identify consistencies.

- Component type
- Material
- Environment
- Aging effect requiring management
- Aging management program

Column 7 documents identified consistencies by noting the appropriate NUREG-1801 item number. If there is no corresponding item number in NUREG-1801 for a particular combination of factors, column 7 is left blank.

Comparisons of system and structure aging management results to NUREG-1801 items are generally within the corresponding system group and preferably within the specific system or structure. For example, aging management results for the safety injection system will generally be compared to NUREG-1801 ESF system results in Chapter V, and preferably to items in Table V.D1 for the emergency core cooling systems for PWRs. In some cases where a particular aging management review result has no valid comparison within the system group, a comparison is made outside the system group. For example, a material, environment, aging effect, and program combination in the safety injection system aging management results may have no comparable item in the NUREG-1801 ESF system results, but a match can be found in the auxiliary systems tables.

Table 1 Item

Column 8 lists the corresponding line item from Table 1. If there is no corresponding item in NUREG-1800, then column 8 is left blank.

Each combination of the following that has an identified NUREG-1801 item number also has a Table 1 line item reference number.

- Component type
- Material

- Environment
- Aging effect requiring management
- Aging management program

Notes

Column 9 contains notes that are used to describe the degree of consistency with the line items in NUREG-1801. Notes that use letter designations are standard notes based on Table 4.2-2 of NEI 95-10 (Ref. 3.0-3). Notes that use numeric designators are specific to the plant site.

Some of the NUREG-1801 evaluations refer to plant-specific programs. In these cases, Note E is used for correlations between the combination in Table 2 and a combination for a line item in NUREG-1801.

FURTHER EVALUATION REQUIRED

The Table 1s in NUREG-1800 indicate that further evaluation is necessary for certain aging effects and other issues discussed in NUREG-1800. Section 3 includes discussions of these issues numbered in accordance with the discussions in NUREG-1800. The discussions explain the site's approach to these areas requiring further evaluation.

REFERENCES

3.0-1 NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, U. S. Nuclear Regulatory Commission, December 2010.

3.0-2 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 2, U. S. Nuclear Regulatory Commission, December 2010.

3.0-3 NEI 95-10, *Industry Guideline for Implementing the Requirements of 10 CFR Part 54 – The License Renewal Rule*, Nuclear Energy Institute (NEI), Revision 6, June 2005.

Table 3.0-1
Service Environments for Mechanical Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Air – indoor	Air in an environment protected from precipitation.	Air – indoor uncontrolled Air – indoor uncontrolled > 35°C (> 95°F) Air with borated water leakage Air with metal temperature up to 288°C (550°F) Air with reactor coolant leakage Air with steam or water leakage System temperature up to 340°C (644°F)
Air – outdoor	The outdoor environment consists of atmospheric air, ambient temperature and humidity, and exposure to precipitation.	Air – outdoor
Concrete	Components in contact with concrete.	Concrete
Condensation	Air and condensation on surfaces of indoor systems with temperatures below dew point; condensation is considered untreated water due to potential for surface contamination. For compressed air systems with dryers, condensation may be conservatively identified as the internal environment.	Condensation
Exhaust gas	Gases, fluids, particulates present in diesel engine exhaust.	Diesel exhaust
Fuel oil	Diesel oil, No. 2 oil, or other liquid hydrocarbons used to fuel diesel engines, boilers, etc.	Fuel oil
Gas	Internal dry non-corrosive gas environments such as nitrogen, carbon dioxide, Freon, and Halon.	Gas
Lube oil	Lubricating oils are low- to medium-viscosity hydrocarbons used for bearing, gear, and engine lubrication. An oil analysis program may be credited to preclude water contamination.	Lubricating oil

Table 3.0-1 (Continued)
Service Environments for Mechanical Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Neutron fluence	Neutron flux integrated over time. Neutron fluence is specified as an environment for the limiting reactor vessel components with material properties that may be significantly affected by neutron irradiation.	Neutron flux High fluence (> 1 x 10^{21} n/cm^2, E > 0.1 million electron volts [MeV])
Raw water	Consists of untreated surface or ground water, whether fresh, brackish, or saline in nature, or water not treated by a chemistry program such as water supplied from an off-site source for fire protection.	Raw water
Soil	External environment for components buried in the soil; exposure to ground water is assumed in soil environments	Soil
Steam	Steam, subject to a water chemistry program. In determining aging effects, steam is considered treated water.	Steam Reactor coolant
Treated borated water	Treated or demineralized borated water.	Treated borated water Reactor coolant
Treated borated water > 140°F	Treated or demineralized borated water above stress corrosion cracking (SCC) threshold for stainless steel.	Treated borated water > 60°C (> 140°F) Reactor coolant > 60°C (> 140°F)
Treated borated water > 482°F	Treated or demineralized borated water above thermal embrittlement threshold for cast austenitic stainless steel (CASS).	Treated borated water > 250°C (> 482°F) Reactor coolant > 250°C (> 482°F)
Treated water	Treated water is demineralized water and is the base water for all clean systems.[1]	Treated water Closed-cycle cooling water Secondary feedwater Raw water (potable)
Treated water > 140°F	Treated water above the SCC threshold for stainless steel	Treated water > 60°C (> 140°F) Closed-cycle cooling water > 60°C (> 140°F)

Table 3.0-1 (Continued)
Service Environments for Mechanical Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Waste water	Water in liquid waste drains such as in liquid radioactive waste systems, oily waste systems, floor drainage systems, chemical waste water systems, and secondary waste water systems. Waste waters may contain contaminants, including oil and boric acid, as well as treated water not monitored by a chemistry program.	Waste water

1. For the aging management review process, and the Table 2 presentation of review results, "treated water" encompasses a range of water types, all of which were chemically treated or demineralized. These water types include treated water, reactor coolant, raw (potable) water, and closed cycle cooling water as defined in NUREG-1801. In the Table 2 results, the type of water can normally be inferred from the context of the result (e.g., if Water Chemistry Control – Closed Treated Water Systems [Section B.1.40] is the aging management program, then the treated water is equivalent to closed cycle cooling water as defined by NUREG-1801). Where such an inference is not clear, a plant-specific note identifies the water type.

   For the comparison of the aging management review results with those of NUREG-1801, as presented in the last three Table 2 columns, and for the summary of results discussed in Table 1, the NUREG-1801 definitions of water types were used. In other words, the "treated water" listed in the results was compared to the corresponding water type of NUREG-1801. The discussions in Table 1, and in the text sections referenced in Table 1 for further evaluation, use the water types defined by NUREG-1801. In these discussions, "treated water" refers only to water controlled by the Water Chemistry Control – Primary and Secondary Program (Section B.1.41).

Table 3.0-2
Service Environments for Structural Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Air – indoor uncontrolled	Air with temperature less than 150°F, humidity up to 100 percent and protected from precipitation. The Air – indoor uncontrolled (External) environment is for indoor locations that are sheltered or protected from weather. Humidity levels up to 100 percent are assumed and the surfaces of components in this environment may be wet. This environment may contain aggressive chemical species including oxygen, halides, sulfates, or other aggressive corrosive substances that can influence the nature, rate, and severity of corrosion effects. It is assumed that these contaminants can concentrate to levels that will promote corrosive effects because of factors such as cyclic (wet-dry) condensation, contaminated insulation, accidental contamination, or leakage areas.	Air – indoor uncontrolled
Air – outdoor	Exposed to the weather with air temperature less than 115°F, humidity up to 100 percent. This environment is subject to periodic wetting and wind. This environment may contain aggressive chemical species including chlorides, oxygen, halides, sulfates, or other aggressive corrosive substances that can influence the nature, rate, and severity of corrosion effects.	Air – outdoor
Concrete	This environment consists of components embedded in concrete.	Concrete

Table 3.0-2 (Continued)
Service Environments for Structural Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Exposed to fluid environment	Fluid environment for structures at WF3 is defined as raw water or treated water. • Raw water – Water from the Mississippi River provides the source of raw water utilized at WF3. Raw water is also rain or ground water. Raw water is water that has not been demineralized or chemically treated to any significant extent. Raw water may contain contaminants. WF3 building sumps may be exposed to a variety of untreated water that is classified as raw water for the determination of aging effects. • Treated water – Treated water is demineralized water or chemically purified water and is the base water for clean systems. Treated water could be deaerated and include corrosion inhibitors, biocides, or some combination of these treatments.	Ground water Treated water Treated water > 140°F Water – flowing Water – standing
Soil	External environment for components at the air/ soil interface, buried in the soil, or exposed to groundwater in the soil. This environment can be "aggressive" or "non-aggressive" depending on its soil properties as defined in NUREG-1801.	Soil

Table 3.0-3
Service Environments for Electrical Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Air – indoor controlled	This environment is one to which the specified internal or external surface of the component or structure is exposed; a humidity-controlled (i.e., air conditioned) environment. For electrical purposes, control must be sufficient to eliminate the cited aging effects of contamination and oxidation without affecting the resistance.	Air – indoor controlled
Air – indoor uncontrolled	Uncontrolled indoor air is associated with systems with temperatures higher than the dew point (i.e., condensation can occur, but only rarely; equipment surfaces are normally dry).	Air – indoor uncontrolled
Air – outdoor	The outdoor environment consists of moist, possibly salt-laden atmospheric air, ambient temperatures and humidity, and exposure to weather, including precipitation and wind. The component is exposed to air and local weather conditions, including salt water spray (if present). A component is considered susceptible to a wetted environment when it is submerged, has the potential to collect water, or is subject to external condensation.	Air – outdoor
Air with borated water leakage	Air and untreated borated water leakage on indoor or outdoor systems with temperatures either above or below the dew point. The water from leakage is considered to be untreated, due to the potential for water contamination at the surface (germane to PWRs).	Air with borated water leakage
Heat, moisture, or radiation and air	Condition in a limited plant area that is significantly more severe than the plant design environment for the cable or connection insulation materials caused by heat, radiation, or moisture, and air.	Adverse localized environment caused by heat, radiation or moisture

Table 3.0-3 (Continued)
Service Environments for Electrical Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
Significant moisture	Condition in a limited plant area that is significantly more severe than the plant design environment for the cable or connection insulation materials caused by significant moisture (moisture that lasts more than a few days—e.g., cable in standing water)	Adverse localized environment caused by significant moisture

3.1 REACTOR VESSEL, INTERNALS AND REACTOR COOLANT SYSTEM

3.1.1 Introduction

This section provides the results of the aging management reviews for components in the reactor vessel, internals and reactor coolant system that are subject to aging management review. The following component groups are addressed in this section (component group descriptions are available in the referenced sections).

- Reactor Vessel (Section 2.3.1.1)
- Reactor Vessel Internals (Section 2.3.1.2)
- Reactor Coolant Pressure Boundary (Section 2.3.1.3)
- Steam Generators (Section 2.3.1.4)
- RCS systems in scope for 10 CFR 54.4(a)(2) (Section 2.3.1.5)

Table 3.1.1, Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the reactor coolant system (RCS) component groups. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.1.2 Results

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for the reactor vessel, internals and reactor coolant system components.

- Table 3.1.2-1 Reactor Vessel—Summary of Aging Management Evaluation
- Table 3.1.2-2 Reactor Vessel Internals—Summary of Aging Management Evaluation
- Table 3.1.2-3 Reactor Coolant Pressure Boundary—Summary of Aging Management Evaluation
- Table 3.1.2-4 Steam Generators—Summary of Aging Management Evaluation

RCS Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.1.2-5-1 Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review
- Table 3.1.2-5-2 Steam Generators, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Review

3.1.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the reactor vessel, internals and reactor coolant system components. Programs are described in Appendix B. Further details are provided in Tables 3.1.2-1 through 3.1.2-5-2.

3.1.2.1.1 Reactor Vessel

Materials

Reactor vessel components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with stainless steel
- High strength steel
- Low alloy steel
- Nickel alloy
- Stainless steel

Environments

Reactor vessel components are exposed to the following environments.

- Air – indoor
- Neutron fluence
- Treated borated water
- Treated borated water > 140ºF

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – wear
- Loss of preload
- Reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the reactor vessel components.

- Bolting Integrity
- Boric Acid Corrosion
- Inservice Inspection
- Reactor Head Closure Studs
- Reactor Vessel Surveillance
- Water Chemistry Control – Primary and Secondary

3.1.2.1.2 Reactor Vessel Internals

Materials

Reactor vessel internals components are constructed of the following materials.

- CASS
- Nickel alloy
- Stainless steel
- Zircaloy

Environments

Reactor vessel internals components are exposed to the following environments.

- Neutron fluence
- Treated borated water
- Treated borated water > 140°F
- Treated borated water > 482°F

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel internals require management.

- Change in dimensions
- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – wear
- Loss of preload
- Reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the reactor vessel internals components.

- Reactor Vessel Internals
- Water Chemistry Control – Primary and Secondary

3.1.2.1.3 Reactor Coolant Pressure Boundary

Materials

Reactor coolant pressure boundary components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with nickel alloy
- Carbon steel clad with stainless steel
- CASS
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- High strength steel
- Nickel alloy
- Stainless steel

Environments

Reactor coolant pressure boundary components are exposed to the following environments.

- Air – indoor
- Lube oil
- Steam
- Treated borated water
- Treated borated water > 140°F
- Treated borated water > 482°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the reactor coolant pressure boundary require management.

- Cracking
- Cracking – fatigue

- Loss of material
- Loss of preload
- Reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the reactor coolant pressure boundary components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Inservice Inspection
- Nickel Alloy Inspection
- Oil Analysis
- One-Time Inspection
- One-Time Inspection – Small-Bore Piping
- Selective Leaching
- Thermal Aging Embrittlement of CASS
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.1.2.1.4 Steam Generators

Materials

Steam generator components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with nickel alloy
- Carbon steel clad with stainless steel
- Nickel alloy
- Stainless steel

Environments

Steam generator components are exposed to the following environments.

- Air – indoor
- Treated borated water
- Treated borated water > 140°F
- Treated water
- Treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the steam generators require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – erosion
- Loss of material – FAC
- Loss of material – wear
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the steam generator components.

- Bolting Integrity
- Boric Acid Corrosion
- Flow-Accelerated Corrosion
- Inservice Inspection
- One-Time Inspection
- Steam Generator Integrity
- Water Chemistry Control – Primary and Secondary

3.1.2.1.5 RCS Components in Scope for 10 CFR 54.4(a)(2)

The following lists encompass materials, environments, aging effects requiring management, and aging management programs for the series 3.1.2-5-x tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Aluminum
- Carbon steel
- Glass
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Lube oil
- Treated borated water
- Treated borated water > 140°F
- Waste water

Aging Effects Requiring Management

The following aging effects associated with nonsafety-related components affecting safety-related systems require management.

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for nonsafety-related components affecting safety-related systems.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – Primary and Secondary

3.1.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.1.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the WF3 approach to these areas requiring further evaluation. Programs are described in Appendix B.

3.1.2.2.1 Cumulative Fatigue Damage

Fatigue is considered a time-limited aging analysis (TLAA) as defined in 10 CFR 54.3 for the reactor vessel, selected components of the reactor vessel internals and most components of the reactor coolant pressure boundary including the reactor coolant pumps, pressurizer and steam generators. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of fatigue for the reactor vessel is discussed in Section 4.3.1.1.

The evaluation of fatigue TLAAs for the ASME Class 1 portions of the reactor coolant pressure boundary piping and components, including those for interconnecting systems, is discussed in Sections 4.3.1.3 through 4.3.1.7.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. Loss of material due to general, pitting, and crevice corrosion for the steel steam generator upper and lower shell and transition cone exposed to secondary feedwater and steam is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. The steam generators have been replaced with Westinghouse Model Delta-110 generators. The replacement steam generators do not have the high-stress region at the shell to transition cone weld found in Model 44 and 51 generators.

2. This paragraph in NUREG-1800 pertains to plants where partial steam generator replacements have been made. The original steam generators were replaced with Westinghouse Model Delta-110 generators.

3.1.2.2.3 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement

1. Neutron irradiation embrittlement is a TLAA evaluated for the period of extended operation in accordance with 10 CFR 54.21(c). The evaluation of loss of fracture toughness for the reactor vessel beltline shell and welds is discussed in Section 4.2.

2. The Reactor Vessel Surveillance Program manages reduction in fracture toughness due to neutron embrittlement of reactor vessel beltline materials. This program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel (RPV) beltline region. As described in Appendix B, the Reactor Vessel Surveillance Program is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance, including recommendations to submit the proposed withdrawal schedule for approval prior to implementation.

3. This paragraph in NUREG-1800 pertains to a plant-specific TLAA for Babcock and Wilcox reactor internals and is therefore not applicable to WF3.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

Both paragraphs in NUREG-1800 apply to BWRs only.

3.1.2.2.5 Crack Growth due to Cyclic Loading

Crack growth due to cyclic loading could occur in reactor vessel shell forgings clad with stainless steel using a high-heat-input welding process. The major portion of the reactor vessel material protected by cladding from exposure to reactor coolant is SA-533, Grade B, Class 1 plate which, as discussed in Regulatory Guide 1.43, is immune to underclad cracking. Cladding performed on SA-508, Class 2 forging material (vessel flange, and nozzles including safe ends) uses low-heat input welding processes controlled to minimize heating of the base metal. Low-heat-input welding processes are not known to induce underclad cracking.

3.1.2.2.6 Cracking due to Stress Corrosion Cracking

1. Cracking due to SCC of the non-Class 1 stainless steel reactor vessel closure head flange leak detection line will be managed by the One-Time Inspection Program. The One-Time Inspection Program will use visual or other nondestructive examination (NDE) techniques to verify the absence of significant cracking of the line.

   The WF3 reactor vessel has no bottom-mounted instrument guide tubes.

2. Cracking due to SCC of cast austenitic stainless steel Class 1 piping, piping components, and piping elements exposed to reactor coolant will be managed by the Water Chemistry Control – Primary and Secondary and Inservice Inspection Programs. The Water Chemistry Control – Primary and Secondary Program minimizes contaminants which promote SCC. The Inservice Inspection Program provides qualified inspection techniques to monitor cracking.

   Susceptibility to thermal aging embrittlement will be evaluated in the Thermal Aging Embrittlement of CASS Program. Aging management for components that are determined to be susceptible to thermal aging embrittlement is accomplished using either enhanced visual examinations or component-specific flaw tolerance evaluations. Additional inspection or evaluations are not required for components that are determined not to be susceptible to thermal aging embrittlement.

3.1.2.2.7 Cracking due to Cyclic Loading

This paragraph in NUREG-1800 applies to BWRs only.

3.1.2.2.8 Loss of Material due to Erosion

This paragraph in NUREG-1800 pertains to loss of material due to erosion in steel steam generator feedwater impingement plates and supports. The WF3 steam generators do not have feedwater impingement plates.

3.1.2.2.9 Removed as a result of LR-ISG-2011-04

This paragraph was removed from NUREG-1800 by LR-ISG-2011-04.

3.1.2.2.10 Removed as a result of LR-ISG-2011-04

This paragraph was removed from NUREG-1800 by LR-ISG-2011-04.

3.1.2.2.11 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

1. Foreign operating experience in steam generators with a similar design to that of Westinghouse Model 51 has identified extensive cracking due to primary water stress corrosion cracking (PWSCC) in steam generator divider plate assemblies fabricated of Alloy 600 and/or the associated Alloy 600 weld materials. The divider plate assemblies and the associated welds of the WF3 replacement steam generators use Alloy 600 materials in limited applications and none is exposed to reactor coolant. The primary head is clad with stainless steel with the exception of areas near junctions with the tubesheet and partition plate which are clad with Alloy 690. The partition plate is composed of Alloy 690 and the tubesheet is clad with Alloy 690. WF3 replacement steam generators (RSGs) use Alloy 600 as a cladding buffer between the channel head and the Alloy 690 weld build-up in the area of the partition plate. The area under the partition plate is filled with Alloy 600 with weld build-up of Alloy 690 over the Alloy 600. Also, a zone approximately 14.50 inches wide centered on the tubesheet 90º-270º axis is buttered with Alloy 600 and followed by subsequent layers of Alloy 690 filler metal. All nickel alloy in contact with primary coolant is Alloy 690.

2. Cracking due to PWSCC could occur in steam generator nickel alloy tube-to-tubesheet welds exposed to reactor coolant. The WF3 replacement steam generators use Alloy 690 steam generator tubes with Alloy 690 tubesheet cladding. Cracking of nickel alloy tube to tubesheet welds is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs.

3.1.2.2.12 Removed as a result of LR-ISG-2011-04

This paragraph was removed from NUREG-1800 by LR-ISG-2011-04.

3.1.2.2.13 Removed as a result of LR-ISG-2011-04

This paragraph was removed from NUREG-1800 by LR-ISG-2011-04.

3.1.2.2.14 Removed as a result of LR-ISG-2011-04

This paragraph was removed from NUREG-1800 by LR-ISG-2011-04.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of WF3 quality assurance procedures and administrative controls for aging management programs.

3.1.2.2.16 Ongoing Review of Operating Experience

See Appendix B Section B.0.4 for discussion of WF3 operating experience review programs.

3.1.2.3 Time-Limited Aging Analyses

TLAAs identified for the reactor coolant system include reactor vessel neutron embrittlement and metal fatigue. These topics are addressed in Section 4.

3.1.3 Conclusion

The reactor vessel, internals and reactor coolant system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the aging effects for the reactor vessel, internals and reactor coolant system components are identified in Section 3.1.2.1 and in the following tables. 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 reactor vessel, internals and reactor coolant system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.1.1
Summary of Aging Management Programs for the Reactor Coolant System
Evaluated in Chapter IV of NUREG-1801

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-1	High strength, low-alloy steel top head closure stud assembly exposed to air with potential for reactor coolant leakage	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA, evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-2	Nickel alloy tubes and sleeves exposed to reactor coolant and secondary feedwater/ steam	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-3	Stainless steel or nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA, evaluated for the period of extended operation (See SRP, Section 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-4	Steel pressure vessel support skirt and attachment welds	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA, evaluated for the period of extended operation (See SRP, Sec 4.3 “Metal Fatigue,” for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	The WF3 reactor vessel does not use a support skirt.
3.1.1-5	Steel, stainless steel, or steel (with stainless steel or nickel alloy cladding) steam generator components, pressurizer relief tank components or piping components or bolting	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation (See SRP, Sec 4.3 “Metal Fatigue,” for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-6	BWR only				
3.1.1-7	BWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-8	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy steam generator components exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. Section 3.1.2.2.1.
3.1.1-9	Steel (with or without nickel-alloy or stainless steel cladding), stainless steel; nickel alloy RCPB piping; flanges; nozzles & safe ends; pressurizer shell heads & welds; heater sheaths & sleeves; penetrations; thermal sleeves exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-10	Steel (with or without nickel-alloy or stainless steel cladding), stainless steel; nickel alloy reactor vessel flanges; nozzles; penetrations; pressure housings; safe ends; thermal sleeves; vessel shells, heads and welds exposed to reactor coolant	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA evaluated for the period of extended operation, and for Class 1 components environmental effects on fatigue are to be addressed. (See SRP, Sec 4.3 "Metal Fatigue," for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-11	BWR only				
3.1.1-12	Steel steam generator components: upper and lower shells, transition cone; new transition cone closure weld exposed to secondary feedwater or steam	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and Chapter XI.M2, "Water Chemistry," and, for Westinghouse Model 44 and 51 S/G, if corrosion of the shell is found, additional inspection procedures are developed	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. Loss of material for steam generator head, shell and transition cone components exposed to secondary feedwater or steam is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. The WF3 replacement steam generators are Westinghouse Model Delta-110. See Section 3.1.2.2.2, Items 1 and 2

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-13	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA is to be evaluated in accordance with Appendix G of 10 CFR Part 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations	Yes, TLAA	Neutron irradiation embrittlement is a TLAA. See Section 3.1.2.2.3, Item 1.
3.1.1-14	Steel (with or without cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Chapter XI.M31, “Reactor Vessel Surveillance”	Yes, plant specific or integrated surveillance program	Consistent with NUREG-1801. The Reactor Vessel Surveillance Program will manage loss of fracture toughness of the reactor vessel beltline materials. See Section 3.1.2.2.3 Item 2.
3.1.1-15	Stainless steel Babcock & Wilcox (including CASS, martensitic SS, and PH SS) and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Reduction of ductility and fracture toughness due to neutron irradiation embrittlement, and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement	Ductility - Reduction in fracture toughness is a TLAA to be evaluated for the period of extended operation. See the SRP, Section 4.7, "Other Plant-Specific TLAAs," for acceptable methods of meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA	The WF3 reactor vessel internals were designed by Combustion Engineering. See Section 3.1.2.2.3, Item 3.
3.1.1-16	BWR only				
3.1.1-17	BWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-18	Reactor vessel shell fabricated of SA508-Cl 2 forgings clad with stainless steel using a high-heat-input welding process exposed to reactor coolant	Crack growth due to cyclic loading	Growth of intergranular separations is a TLAA evaluated for the period of extended operation. The Standard Review Plan, Section 4.7, “Other Plant- Specific Time-Limited Aging Analysis,” provides guidance for meeting the requirements of 10 CFR 54.21(c).	Yes, TLAA	Most reactor vessel material protected by cladding is SA-533, Grade B, Class 1 plate. Cladding performed on SA-508, Class 2 forging material (vessel flange, and nozzles including safe ends) used low-heat input welding processes. See Section 3.1.2.2.5.
3.1.1-19	Stainless steel reactor vessel closure head flange leak detection line and bottom-mounted instrument guide tubes (external to reactor vessel)	Cracking due to stress corrosion cracking	A plant-specific aging management program is to be evaluated	Yes, plant-specific	Cracking of the stainless steel reactor vessel closure head flange leak detection line will be managed by the One-Time Inspection Program. The WF3 reactor vessel has no bottom-mounted instrument guide tubes. See Section 3.1.2.2.6, Item 1.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-20	Cast austenitic stainless steel Class 1 piping, piping components, and piping elements exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry” and, for CASS components that do not meet the NUREG-0313 guidelines, a plant specific aging management program	Yes, plant-specific	Cracking of cast austenitic stainless steel Class 1 piping, piping components, and piping elements exposed to reactor coolant will be managed by the Inservice Inspection, Thermal Aging Embrittlement of CASS and Water Chemistry Control – Primary and Secondary Programs. See Section 3.1.2.2.6, Item 2.
3.1.1-21	BWR only				
3.1.1-22	Steel steam generator feedwater impingement plate and support exposed to secondary feedwater	Loss of material due to erosion	A plant-specific aging management program is to be evaluated	Yes, plant-specific	The WF3 steam generators do not have steel steam generator feedwater impingement plates. See Section 3.1.2.2.8.
3.1.1-23	[There is no 3.1.1-23 in NUREG-1800 as modified by the ISGs.]				
3.1.1-24	[There is no 3.1.1-24 in NUREG-1800 as modified by the ISGs.]				

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-25	Steel (with nickel-alloy cladding) or nickel alloy steam generator primary side components: divider plate and tube-to-tube sheet welds exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M2, "Water Chemistry"	Yes, plant-specific	Cracking of nickel alloy tube to tubesheet welds is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs. Cracking of the nickel alloy (Alloy 690) steam generator primary side divider plate exposed to reactor coolant is managed by the Water Chemistry Control – Primary and Secondary Program. See Section 3.1.2.2.11, Items 1 and 2
3.1.1-26	[There is no 3.1.1-26 in NUREG-1800 as modified by the ISGs.]				
3.1.1-27	[There is no 3.1.1-27 in NUREG-1800 as modified by the ISGs.]				
3.1.1-28	Stainless steel Combustion Engineering "Existing Programs" components exposed to reactor coolant and neutron flux	Loss of material due to wear; cracking due to stress-corrosion cracking, irradiation-assisted stress-corrosion cracking, or fatigue	Chapter XI.M16A, "PWR Vessel Internals," and Chapter XI.M2, "Water Chemistry" (for SCC mechanisms only)	No	The WF3 reactor vessel internals design does not include thermal shield positioning pins.
3.1.1-29	BWR only				
3.1.1-30	BWR only				
3.1.1-31	BWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-32	Stainless steel, nickel alloy, or CASS reactor vessel internals, core support structure (not already referenced as ASME Section XI Examination Category B-N-3 core support structure components in MRP-227-A), exposed to reactor coolant and neutron flux	Cracking, or loss of material due to wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" or Chapter XI.M16A, "PWR Vessel Internals," invoking applicable 10 CFR 50.55a and ASME Section XI inservice inspection requirements for these components	No	Cracking and loss of material due to wear of the reactor vessel internals core support structure components is managed by the Reactor Vessel Internals Program which uses ASME Section XI Inservice Inspection, Subsection IWB as required. These AMR results are compared to other table items (3.1.1-52a, 3.1.1-52b, 3.1.1-52c, 3.1.1-55b and 3.1.1-56c).
3.1.1-33	Stainless steel, steel with stainless steel cladding Class 1 reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for ASME components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of stainless steel reactor coolant pressure boundary components is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs.
3.1.1-34	Stainless steel, steel with stainless steel cladding pressurizer relief tank (tank shell and heads, flanges, nozzles) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for ASME components, and Chapter XI.M2, "Water Chemistry"	No	The nonsafety-related relief tank is not subject to ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-35	Stainless steel, steel with stainless steel cladding reactor coolant system cold leg, hot leg, surge line, and spray line piping and fittings exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components	No	Consistent with NUREG-1801. Cracking of Class 1 reactor coolant piping is managed by the Inservice Inspection Program.
3.1.1-36	Steel, stainless steel pressurizer integral support exposed to air with metal temperature up to 288°C (550°F)	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components	No	Consistent with NUREG-1801. Cracking of the pressurizer support skirt is managed by the Inservice Inspection Program.
3.1.1-37	Steel reactor vessel flange	Loss of material due to wear	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components	No	Consistent with NUREG-1801. Loss of material due to wear of the vessel flange is managed by the Inservice Inspection Program.
3.1.1-38	Cast austenitic stainless steel Class 1 pump casings, and valve bodies and bonnets exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components. For pump casings and valve bodies, screening for susceptibility to thermal aging is not necessary.	No	Consistent with NUREG-1801. The Inservice Inspection Program manages the reduction of fracture toughness in cast austenitic stainless steel pump casings and valve bodies in the reactor coolant pressure boundary.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-39	Steel, stainless steel, or steel with stainless steel cladding Class 1 piping, fittings and branch connections < NPS 4 exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking (for stainless steel only), and thermal, mechanical, and vibratory loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, Chapter XI.M2, "Water Chemistry," and XI.M35, "One-Time Inspection of ASME Code Class 1 Small-bore Piping"	No	Consistent with NUREG-1801. Cracking in stainless steel components of the reactor coolant pressure boundary exposed to reactor coolant is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. The One-Time Inspection – Small-Bore Piping Program will verify the effectiveness of the water chemistry program and will manage cracking in piping and fittings < 4" NPS.
3.1.1-40	Steel with stainless steel or nickel alloy cladding; or stainless steel pressurizer components exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of Class 1 pressurizer components is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs.
3.1.1-40.5	Nickel alloy core support pads; core guide lugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of nickel alloy vessel internal attachments is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-41	BWR only				
3.1.1-42	Steel with stainless steel or nickel alloy cladding or stainless steel primary side components; steam generator upper and lower heads, and tube sheet weld; or pressurizer components exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of steel with stainless steel or nickel alloy cladding and stainless steel pressurizer components is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. WF3 uses recirculating steam generators.
3.1.1-43	BWR only				
3.1.1-44	Steel steam generator secondary manways and handholes (cover only) exposed to air with leaking secondary-side water and/ or steam	Loss of material due to erosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 2 components	No	Consistent with NUREG-1801 for manways and handholes without seal welded diaphragms. The Inservice Inspection Program manages loss of material due to erosion for steel secondary side steam generator manway and handhole covers.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-45	Nickel alloy and steel with nickel-alloy cladding reactor coolant pressure boundary components exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI ISI, IWB, IWC & IWD," and Chapter XI.M2, "Water Chemistry," and, for nickel-alloy, Chapter XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced Corrosion in RCPB Components (PWRs Only)"	No	Consistent with NUREG-1801 for nickel alloy (Alloy 600) components. Cracking of nickel alloy (Alloy 600) components is managed by the Inservice Inspection, Nickel Alloy Inspection and Water Chemistry Control – Primary and Secondary Programs. For other nickel alloy (Alloy 690) components, cracking is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. Loss of material due to boric acid corrosion in steel external surfaces near nickel alloy (Alloy 600) pressure boundary components is addressed in Item 3.1.1-48.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-46	Stainless steel, nickel-alloy, nickel-alloy welds and/or buttering control rod drive head penetration pressure housing or nozzles safe ends and welds (inlet, outlet, safety injection) exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI ISI, IWB, IWC & IWD," and Chapter XI.M2, "Water Chemistry," and, for nickel-alloy, Chapter XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-induced corrosion in RCPB Components (PWRs Only)"	No	The control element drive mechanism (CEDM) motor housing lower end fitting is composed of Alloy 690. Cracking of this component is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. The reactor vessel safe ends are carbon steel clad with stainless steel and are compared to Item 3.1.1-33.
3.1.1-47	Stainless steel, nickel-alloy control rod drive head penetration pressure housing exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M1, "ASME Section XI ISI, IWB, IWC & IWD," and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of the stainless CEDM motor housing components is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. Nickel alloy components are compared to Item 3.1.1-46.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-48	Steel external surfaces: reactor vessel top head, reactor vessel bottom head, reactor coolant pressure boundary piping or components adjacent to dissimilar metal (Alloy 82/ 182) welds exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion," and Chapter XI.M11B, "Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid- Induced Corrosion in RCPB Components (PWRs Only)"	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion in steel external surfaces near nickel alloy (Alloy 600) pressure boundary components, is managed by the Boric Acid Corrosion and Nickel Alloy Inspection Programs.
3.1.1-49	Steel reactor coolant pressure boundary external surfaces or closure bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion in steel components is managed by the Boric Acid Corrosion Program.
3.1.1-50	Cast austenitic stainless steel Class 1 piping, piping component, and piping elements and control rod drive pressure housings exposed to reactor coolant >250 deg-C (>482 deg-F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No	Consistent with NUREG-1801. Loss of fracture toughness in CASS components is managed by the Thermal Aging Embrittlement of CASS Program.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-51a	Stainless steel or nickel alloy Babcock & Wilcox reactor internal “Primary” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-51b	Stainless steel or nickel alloy Babcock & Wilcox reactor internal “Expansion” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, fatigue, or overload	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-52a	Stainless steel or nickel alloy Combustion Engineering reactor internal “Primary” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	Consistent with NUREG-1801 for stainless steel “Primary” components. Cracking of stainless steel reactor vessel internals components is managed by the Reactor Vessel Internals and Water Chemistry Control – Primary and Secondary Programs. There are no nickel alloy “Primary” internals components.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-52b	Stainless steel or nickel alloy Combustion Engineering reactor internal “Expansion” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	Consistent with NUREG-1801 for stainless steel “Expansion” components. Cracking of stainless steel reactor vessel internals components is managed by the Reactor Vessel Internals and Water Chemistry Control – Primary and Secondary Programs. There are no nickel alloy “Expansion” internals components.
3.1.1-52c	Stainless steel or nickel alloy Combustion Engineering reactor internal “Existing Programs” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	Consistent with NUREG-1801 for stainless steel “Existing Programs” components. Cracking of stainless steel reactor vessel internals components is managed by the Reactor Vessel Internals and Water Chemistry Control – Primary and Secondary Programs. There are no nickel alloy “Existing Programs” internals components.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-53a	Stainless steel or nickel alloy Westinghouse reactor internal “Primary” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-53b	Stainless steel Westinghouse reactor internal “Expansion” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-53c	Stainless steel or nickel alloy Westinghouse reactor internal “Existing Programs” components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry” (for SCC mechanisms only)	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-54	Stainless steel bottom mounted instrument system flux thimble tubes (with or without chrome plating) exposed to reactor coolant and neutron flux	Loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals,” or Chapter XI.M37, "Flux Thimble Tube Inspection"	No	The Combustion Engineering designed reactor vessel does not use bottom mounted instrument system flux thimble tubes.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-55a	Stainless steel or nickel alloy Babcock and Wilcox reactor internal "No Additional Measures" components exposed to reactor coolant and neutron flux	No additional aging management for reactor internal "No Additional Measures" components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience invalidates MRP-227-A.	Chapter XI.M16A, "PWR Vessel Internals"	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-55b	Stainless steel or nickel alloy Combustion Engineering reactor internal "No Additional Measures" components exposed to reactor coolant and neutron flux	No additional aging management for reactor internal "No Additional Measures" components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience invalidates MRP-227-A.	Chapter XI.M16A, "PWR Vessel Internals"	No	Consistent with NUREG-1801 for stainless steel or nickel alloy "No Additional Measures" components. The Reactor Vessel Internals Program manages aging effects for these components. The Water Chemistry Control – Primary and Secondary Program supplements the Reactor Vessel Internals Program for the prevention of stress corrosion cracking.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-55c	Stainless steel or nickel alloy Westinghouse reactor internal "No Additional Measures" components exposed to reactor coolant and neutron flux	No additional aging management for reactor internal "No Additional Measures" components unless required by ASME Section XI, Examination Category B-N-3 or relevant operating experience invalidates MRP-227-A.	Chapter XI.M16A, "PWR Vessel Internals"	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-56a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Combustion Engineering reactor internal "Primary" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	No	Consistent with NUREG-1801 for stainless steel "Primary" components. Reduction of fracture toughness and changes in dimension of stainless steel reactor vessel internals components are managed by the Reactor Vessel Internals Program. There are no nickel alloy "Primary" internals components.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-56b	Stainless steel (SS, including CASS, PH SS or martensitic SS) Combustion Engineering “Expansion” reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	Consistent with NUREG-1801 for stainless steel “Expansion” components. Reduction of fracture toughness and changes in dimension of stainless steel reactor vessel internals components is managed by the Reactor Vessel Internals Program.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-56c	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Combustion Engineering reactor internal "Existing Programs" components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	No	Consistent with NUREG-1801 for stainless steel "Existing" components. Reduction of fracture toughness, loss of preload and loss of material due to wear of stainless steel and Zircaloy reactor vessel internals components is managed by the Reactor Vessel Internals Program. There are no nickel alloy "Existing" internals components.
3.1.1-57	[There is no 3.1.1-57 in NUREG-1800.]				

Table 3.1.1: Reactor Coolant System					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-58a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Babcock & Wilcox reactor internal “Primary” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to wear; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-58b	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Babcock & Wilcox reactor internal “Expansion” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	The WF3 reactor vessel internals were designed by Combustion Engineering.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-59a	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Westinghouse reactor internal “Primary” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	The WF3 reactor vessel internals were designed by Combustion Engineering.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-59b	Stainless steel (SS, including CASS, PH SS or martensitic SS) Westinghouse reactor internal “Expansion” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	The WF3 reactor vessel internals were designed by Combustion Engineering.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-59c	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel alloy Westinghouse reactor internal “Existing Programs” components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement and for CASS, martensitic SS, and PH SS due to thermal aging embrittlement; or changes in dimensions due to void swelling or distortion; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No	The WF3 reactor vessel internals were designed by Combustion Engineering.
3.1.1-60	BWR only				

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-61	Steel steam generator steam nozzle and safe end, feedwater nozzle and safe end, AFW nozzles and safe ends exposed to secondary feedwater/ steam	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801 for the steam generator blowdown nozzles. The Flow-Accelerated Corrosion Program manages loss of material due to FAC for these nozzles. The steam generator outlet nozzles use nickel alloy flow inserts which protects the steel nozzle from flow accelerated corrosion (FAC). The feedwater nozzles contain a nickel alloy thermal sleeve that isolates the carbon steel nozzle from feedwater flow, so the feedwater nozzles are not susceptible to FAC.
3.1.1-62	High-strength, low alloy steel, or stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Cracking due to stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Cracking of stainless steel and high-strength steel bolting is managed by the Bolting Integrity Program.
3.1.1-63	BWR only				
3.1.1-64	Steel closure bolting exposed to air – indoor uncontrolled	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material for steel closure bolting is managed by the Bolting Integrity Program.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-65	Stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Loss of material due to wear	Chapter XI.M18, "Bolting Integrity"	No	WF3 does not use bolting for the control rod drive head penetration flange.
3.1.1-66	High-strength, low alloy steel, or stainless steel closure bolting; stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload for steel, high-strength steel and stainless steel closure bolting is managed by the Bolting Integrity Program.
3.1.1-67	Steel or stainless steel closure bolting exposed to air – indoor with potential for reactor coolant leakage	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload for steel closure bolting is managed by the Bolting Integrity Program. Loss of preload for stainless steel closure bolting is compared to Item 3.1.1-66.
3.1.1-68	Nickel alloy steam generator tubes exposed to secondary feedwater or steam	Changes in dimension ("denting") due to corrosion of carbon steel tube support plate	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	The WF3 replacement steam generators do not use carbon steel tube support plates.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-69	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Cracking due to outer diameter stress corrosion cracking and intergranular attack	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of nickel alloy steam generator components is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs.
3.1.1-70	Nickel alloy steam generator tubes, repair sleeves, and tube plugs exposed to reactor coolant	Cracking due to primary water stress corrosion cracking	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking of nickel alloy steam generator components is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs.
3.1.1-71	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking or other mechanism(s); loss of material due general (steel only), pitting, and crevice corrosion	Chapter XI.M19, "Steam Generators," and Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Cracking and loss of material for steam generator tube support components is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-72	Steel steam generator tube support plate, tube bundle wrapper, supports and mounting hardware exposed to secondary feedwater or steam	Loss of material due to erosion, general, pitting, and crevice corrosion, ligament cracking due to corrosion	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801. Loss of material for carbon steel steam generator support components exposed to secondary feedwater or steam is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs. The WF3 replacement steam generators do not use carbon steel tube support plates.
3.1.1-73	Nickel alloy steam generator tubes and sleeves exposed to phosphate chemistry in secondary feedwater or steam	Loss of material due to wastage and pitting corrosion	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	WF3 does not use phosphate chemistry in the secondary feedwater.
3.1.1-74	Steel steam generator upper assembly and separators including feedwater inlet ring and support exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	The WF3 replacement steam generator steel feedwater piping components are composed of alloy steel (Cr-Mo) which is resistant to FAC.
3.1.1-75	Steel steam generator tube support lattice bars exposed to secondary feedwater or steam	Wall thinning due to flow-accelerated corrosion and general corrosion	Chapter XI.M19, “Steam Generators,” and Chapter XI.M2, “Water Chemistry”	No	The WF3 replacement steam generators do not use carbon steel tube support lattice bars.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-76	Steel, chrome plated steel, stainless steel, nickel alloy steam generator U-bend supports including anti-vibration bars exposed to secondary feedwater or steam	Loss of material due to fretting	Chapter XI.M19, "Steam Generators"	No	Consistent with NUREG-1801. Loss of material due to fretting (wear) for steel, stainless steel and nickel alloy steam generator tube support components is managed by the Steam Generator Integrity Program.
3.1.1-77	Nickel alloy steam generator tubes and sleeves exposed to secondary feedwater or steam	Loss of material due to wear and fretting	Chapter XI.M19, "Steam Generators"	No	Consistent with NUREG-1801. Loss of material due to fretting (wear) nickel alloy steam generator tubes is managed by the Steam Generator Integrity Program.
3.1.1-78	Nickel alloy steam generator components such as, secondary side nozzles (vent, drain, and instrumentation) exposed to secondary feedwater or steam	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection," or Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD."	No	Consistent with NUREG-1801. Cracking of nickel alloy steam generator components exposed to secondary feedwater or steam is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.
3.1.1-79	BWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-80	Stainless steel or steel with stainless steel cladding pressurizer relief tank: tank shell and heads, flanges, nozzles (none-ASME Section XI components) exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Cracking of stainless steel non-Class 1 components is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.
3.1.1-81	Stainless steel pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	The pressurizer spray head components are made of nickel alloy.
3.1.1-82	Nickel alloy pressurizer spray head exposed to reactor coolant	Cracking due to stress corrosion cracking, primary water stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Cracking of nickel alloy spray head components is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-83	Steel steam generator shell assembly exposed to secondary feedwater or steam	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material of steel steam generator components exposed to secondary feedwater or steam is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.
3.1.1-84	BWR only				
3.1.1-85	BWR only				
3.1.1-86	Stainless steel steam generator primary side divider plate exposed to reactor coolant	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry”	No	The steam generator primary side divider plate is made of nickel alloy (Alloy 690).
3.1.1-87	Stainless steel or nickel-alloy PWR reactor internal components exposed to reactor coolant and neutron flux	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801. Loss of material of stainless steel or nickel alloy reactor vessel internal components is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-88	Stainless steel; steel with nickel-alloy or stainless steel cladding; and nickel-alloy reactor coolant pressure boundary components exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801. Loss of material of steel with nickel alloy or stainless steel cladding, stainless steel, and nickel-alloy components exposed to reactor coolant is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.
3.1.1-89	Steel piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material of steel components exposed to closed cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.1.1-90	Copper alloy piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material of copper alloy components exposed to closed cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.1.1-91	BWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-92	High-strength low alloy steel closure head stud assembly exposed to air with potential for reactor coolant leakage	Cracking due to stress corrosion cracking; loss of material due to general, pitting, and crevice corrosion, or wear (PWR)	Chapter XI.M3, "Reactor Head Closure Stud Bolting"	No	Consistent with NUREG-1801. Cracking, loss of material, and loss of material due to wear of the closure head stud assembly is managed by the Reactor Head Closure Studs Program.
3.1.1-93	Copper alloy >15% Zn or > 8% [aluminum] Al piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Consistent with NUREG-1801. Loss of material of copper alloy >15% Zn or > 8% Al components exposed to closed cycle cooling water is managed by the Selective Leaching Program.
3.1.1-94	BWR only				
3.1.1-95	BWR only				
3.1.1-96	BWR only				
3.1.1-97	BWR only				
3.1.1-98	BWR only				
3.1.1-99	BWR only				
3.1.1-100	BWR only				
3.1.1-101	BWR only				
3.1.1-102	BWR only				
3.1.1-103	BWR only				
3.1.1-104	BWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-105	Steel piping, piping components and piping element exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with [American Concrete Institute] ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant [operating experience] OE indicates no degradation of the concrete	No, if conditions are met.	No steel reactor coolant system or reactor coolant pressure boundary piping components are embedded in concrete.
3.1.1-106	Nickel alloy piping, piping components and piping element exposed to air – indoor, uncontrolled, or air with borated water leakage	None	None	NA – No [aging effect/ mechanism] AEM or AMP	Consistent with NUREG-1801.
3.1.1-107	Stainless steel piping, piping components and piping element exposed to gas, concrete, air with borated water leakage, air – indoors, uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for components exposed to air. There are no stainless steel RCS components exposed to gas or concrete in the scope of license renewal.
3.1.1-108	[There is no 3.1.1-108 in NUREG-1800.]				
3.1.1-109	[There is no 3.1.1-109 in NUREG-1800.]				
3.1.1-110	BWR only				

Notes for Tables 3.1.2-1 through 3.1.2-5-2

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

101. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

102. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

103. This component is not composed of Alloy 600/82/182 materials. Alloy 690 is not considered susceptible to primary water stress corrosion cracking.

104. Nuts and washers are high strength steel but stud materials are not high strength steel. Measured yield strength of stud material < 150 kilo-pounds per square inch (ksi).

105. High component surface temperature precludes moisture accumulation that could result in corrosion.

Table 3.1.2-1
Reactor Vessel
Summary of Aging Management Evaluation

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Reactor vessel components	Pressure boundary	Carbon steel, Carbon steel clad with stainless steel, Nickel alloy, Stainless steel	Treated borated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.A2.R-219	3.1.1-10	A
Reactor vessel components • Closure head stud assemblies	Pressure boundary	Low alloy steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.A2.RP-54	3.1.1-1	A, 104
Bolting ICI/HJTC-CET assemblies • Swageloc® modified bodies • Compression collar • Hold down nuts	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.A2.R-80	3.1.1-66	B
Closure head • Center dome	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Closure head • Center dome	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	C
Closure head • Center dome	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Closure head • Flange	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A
Closure head • Flange	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	C
Closure head • Flange	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material – wear	Inservice Inspection	IV.A2.R-87	3.1.1-37	A
Closure head • Flange	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Closure head penetrations • Vent pipe nozzle • CEDM and ICI nozzles	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Closure head penetrations • Vent pipe nozzle • CEDM and ICI nozzles	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.R-90	3.1.1-45	E, 103
Closure head penetrations • Vent pipe nozzle • CEDM and ICI nozzles	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-378	3.1.1-106	A
Closure head bolting • Nuts • Washers	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion Reactor Head Closure Studs	IV.A2.RP-53 IV.A2.R-17	3.1.1-92 3.1.1-49	A, 104
Closure head bolting • Nuts • Washers	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material – wear	Reactor Head Closure Studs	IV.A2.RP-53	3.1.1-92	A, 104
Closure head bolting • Nuts • Washers	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Reactor Head Closure Studs	IV.A2.RP-52	3.1.1-92	A, 104
Closure head bolting • Studs	Pressure boundary	Low alloy steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion Reactor Head Closure Studs	IV.A2.RP-53 IV.A2.R-17	3.1.1-92 3.1.1-49	A, 104

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Closure head bolting • Studs	Pressure boundary	Low alloy steel	Air – indoor (ext)	Loss of material – wear	Reactor Head Closure Studs	IV.A2.RP-53	3.1.1-92	A, 104
Control rod drive assembly • CEDM motor housing (tube) and upper end fitting • Versa vent assembly ICI assembly • Flange adaptor • Seal plug • Swageloc® modified body • Compression collar/ nut	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	C
	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-55	3.1.1-47	A
	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	C
Control rod drive assembly • CEDM motor housing lower end fitting	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A
Control rod drive assembly • CEDM motor housing lower end fitting	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-234	3.1.1-46	E, 103
Flow skirt	Pressure boundary	Nickel alloy	Treated borated water (int/ext)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	C

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow skirt	Pressure boundary	Nickel alloy	Treated borated water (int/ext)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-57	3.1.1-40.5	C
Nozzles (including safe ends) Inlet / outlet	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A
Nozzles (including safe ends) • Inlet / outlet	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	C
Nozzles (including safe ends) • Inlet / outlet	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Vessel external attachment • Vessel support pads	Structural support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Vessel external attachment • Closure head lifting lugs	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Vessel internal attachments • Core stabilizing lugs • Core stop lugs	Structural support	Nickel alloy	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	C
Vessel internal attachments • Core stabilizing lugs • Core stop lugs	Structural support	Nickel alloy	Treated borated water (ext)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-57	3.1.1-40.5	A
Vessel flange (including core barrel support ledge)	Pressure boundary Structural support	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A
Vessel flange (including core barrel support ledge)	Pressure boundary Structural support	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	C
Vessel flange (including core barrel support ledge)	Pressure boundary Structural support	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material – wear	Inservice Inspection	IV.A2.R-87	3.1.1-37	A
Vessel flange (including core barrel support ledge)	Pressure boundary Structural support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Vessel shell assembly (including welds) • Bottom head - Torus - Dome	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A
Vessel shell assembly (including welds) • Bottom head - Torus - Dome	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	C
Vessel shell assembly (including welds) • Bottom head - Torus - Dome	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Vessel shell assembly (including welds) • Upper shell • Intermediate shell • Lower shell	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.A2.RP-28	3.1.1-88	A
Vessel shell assembly (including welds) • Upper shell • Intermediate shell • Lower shell	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	C

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Vessel shell assembly (including welds) • Upper shell • Intermediate shell • Lower shell	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int) Neutron fluence	Reduction of fracture toughness	TLAA – neutron fluence Reactor Vessel Surveillance	IV.A2.R-84 IV.A2.RP-229	3.1.1-13 3.1.1-14	A
Vessel shell assembly (including welds) • Upper shell • Intermediate shell • Lower shell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A

Table 3.1.2-2
Reactor Vessel Internals
Summary of Aging Management Evaluation

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Reactor vessel internals components	Structural support Flow distribution	Stainless steel, nickel alloy, CASS	Treated borated water	Cracking – fatigue	TLAA – metal fatigue	IV.B3.RP-339	3.1.1-3	A
Lower support structure assembly • Core support plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-343	3.1.1-52a	A
Lower support structure assembly • Core support plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Lower support structure assembly • Core support plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Lower support structure assembly • Core support plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B3.RP-365	3.1.1-56a	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Reactor vessel internal connector components: • Bolts • Studs • Nuts • Washers • Locking bars • Locking caps • Locking keys • Dowels • Cap screws	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Lower support structure assembly • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (X) Water Chemistry Control – Primary and Secondary	IV.B3.RP-334	3.1.1-52c	A
Lower support structure assembly • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Lower support structure assembly • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (X)	IV.B3.RP-336	3.1.1-56c	A
Lower support structure assembly • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (X)	IV.B3.RP-336	3.1.1-56c	A
Lower support structure assembly • Core support column welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-363	3.1.1-52a	A
Lower support structure assembly • Core support column welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Lower support structure assembly • Core support column welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B3.RP-364	3.1.1-56a	A
Lower support structure assembly • Core support beams	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-335	3.1.1-52b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower support structure assembly • Core support beams	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Lower support structure assembly • Core support beams	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Lower support structure assembly • Deep core support beams	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-335	3.1.1-52b	A
Lower support structure assembly • Deep core support beams	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Lower support structure assembly • Deep core support beams	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B3.RP-331	3.1.1-56b	C
Core support barrel assembly • Upper cylinder, including welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-329	3.1.1-52b	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Core support barrel assembly • Upper cylinder, including welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Upper cylinder, including welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B3.RP-362b	3.1.1-56b	C
Core support barrel assembly • Lower cylinder girth welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-362a	3.1.1-52a	A
Core support barrel assembly • Lower cylinder girth welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Lower cylinder girth welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B3.RP-362	3.1.1-56a	A
Core support barrel assembly • Lower cylinder axial welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-362c	3.1.1-52b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Core support barrel assembly • Lower cylinder axial welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Lower cylinder axial welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B3.RP-362b	3.1.1-56b	A
Core support barrel assembly • Upper section flange	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-329	3.1.1-52b	A
Core support barrel assembly • Upper section flange	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Upper section flange	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (X)	IV.B3.RP-332	3.1.1-56c	A
Core support barrel assembly • Upper section flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-327	3.1.1-52a	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Core support barrel assembly • Upper section flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Lower section flange	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-333	3.1.1-52b	A
Core support barrel assembly • Lower section flange	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Lower section flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-328	3.1.1-52a	A
Core support barrel assembly • Lower section flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Alignment keys	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Core support barrel assembly • Alignment keys	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Alignment keys	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core support barrel assembly • Snubber assembly shims and pins	Structural support	Nickel alloy	Treated borated water	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Core support barrel assembly • Snubber assembly shims and pins	Structural support	Nickel alloy	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Snubber assembly shims and pins	Structural support	Nickel alloy	Treated borated water	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core support barrel assembly • Snubber assembly bolt	Structural support	Nickel alloy	Treated borated water	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Core support barrel assembly • Snubber assembly bolt	Structural support	Nickel alloy	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core support barrel assembly • Snubber assembly bolt	Structural support	Nickel alloy	Treated borated water	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core support barrel assembly • Snubber assembly bolt	Structural support	Nickel alloy	Treated borated water	Loss of preload	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Upper guide structure support plate assembly	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Upper guide structure support plate assembly	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Upper internals assembly • Upper guide structure support plate assembly	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (X)	IV.B3.RP-332	3.1.1-56c	C
Upper internals assembly • Fuel alignment plate	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Fuel alignment plate	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Upper internals assembly • Fuel alignment plate	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Fuel alignment plate	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Core shroud assembly • Shroud vertical plates • Former plates • Axial and horizontal weld seams near the central flange and horizontal stiffeners	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-326a	3.1.1-52a	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (P)	IV.B3.RP-326	3.1.1-56a	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B3.RP-326	3.1.1-56a	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Core shroud assembly • Shroud vertical plate to former plate axial and horizontal weld seams in extended area around core midplane	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-323	3.1.1-52b	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (E)	IV.B3.RP-359a	3.1.1-56b	C
	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B3.RP-326	3.1.1-56a	A
Core shroud assembly • Weld between upper and lower vertical ring sections	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Core shroud assembly • Weld between upper and lower vertical ring sections	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Core shroud assembly • Weld between upper and lower vertical ring sections	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (P)	IV.B3.RP-326	3.1.1-56a	A
Core shroud assembly • Weld between upper and lower vertical ring sections	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core shroud lug and lug inserts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Core shroud lug and lug inserts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core shroud lug and lug inserts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (X)	IV.B3.RP-319	3.1.1-56c	A
Core shroud lug and lug inserts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core shroud lug and lug inserts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (X)	IV.B3.RP-319	3.1.1-56c	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Core shroud lug and lug inserts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core shroud lug dowel pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (X) Water Chemistry Control – Primary and Secondary	IV.B3.RP-320	3.1.1-52c	A
Core shroud lug dowel pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Core shroud lug dowel pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (X)	IV.B3.RP-319	3.1.1-56c	A
Core shroud lug dowel pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Core shroud lug dowel pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Upper internals CEA shroud assembly • Peripheral instrument tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B3.RP-312	3.1.1-52a	A

Table 3.1.2-2: Reactor Vessel Internals								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Upper internals CEA shroud assembly • Peripheral instrument tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Upper internals CEA shroud assembly • Peripheral instrument tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Upper internals CEA shroud assembly • Non-peripheral instrument tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B3.RP-313	3.1.1-52b	A
Upper internals CEA shroud assembly • Non-peripheral instrument tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Upper internals CEA shroud assembly • Non-peripheral instrument tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Flow bypass insert assembly	Flow distribution	CASS (CF8 Casting)	Treated borated water > 482°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Upper internals assembly • Flow bypass insert assembly	Flow distribution	CASS (CF8 Casting)	Treated borated water > 482°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Upper internals assembly • Flow bypass insert assembly	Flow distribution	CASS (CF8 Casting)	Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Socket head cap screw (CEA shroud bolts)	Structural support	Precipitation hardened SS (AMS 5736-F or A286)	Treated borated water > 482°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Upper internals assembly • Socket head cap screw (CEA shroud bolts)	Structural support	Precipitation hardened SS (AMS 5736-F or A286)	Treated borated water > 482°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Upper internals assembly • Socket head cap screw (CEA shroud bolts)	Structural support	Precipitation hardened SS (AMS 5736-F or A286)	Treated borated water > 482°F Neutron fluence	Loss of preload	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
CEA shroud assembly • Modified shroud ext. shaft guide sub-assembly • Extension shaft guide	Structural support	CASS (ASTM A351-72 Grade CF8)	Treated borated water > 482ºF	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
CEA shroud assembly • Modified shroud ext. shaft guide sub-assembly • Extension shaft guide	Structural support	CASS (ASTM A351-72 Grade CF8)	Treated borated water > 482ºF	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
CEA shroud assembly • Modified shroud ext. shaft guide sub-assembly • Extension shaft guide	Structural support	CASS (ASTM A351-72 Grade CF8)	Treated borated water > 482ºF	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
CEA extension shaft guides	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
CEA extension shaft guides	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
CEA extension shaft guides	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
CEA shroud assembly • Tube	Structural support	CASS (CPF8 304 SS casting)	Treated borated water > 482°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
CEA shroud assembly • Tube	Structural support	CASS (CPF8 304 SS casting)	Treated borated water > 482°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
CEA shroud assembly • Tube	Structural support	CASS (CPF8 304 SS casting)	Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Holddown spring	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Holddown spring	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Holddown spring	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Holddown spring	Structural support	Stainless steel	Treated borated water > 140°F	Loss of preload	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A

Table 3.1.2-2: Reactor Vessel Internals

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Incore Instrumentation • Thimble - lower part	Structural support	Zircaloy	Treated borated water > 140°F Neutron fluence	Change in dimension	Reactor Vessel Internals (X)	--	--	H
Reactor vessel internal components not addressed in another line item	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Reactor vessel internal components not addressed in another line item	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A
Reactor vessel internal components not addressed in another line item	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B3.RP-306	3.1.1-55b	A
Reactor vessel internal components not addressed in another line item	Structural support	Nickel alloy	Treated borated water Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B3.RP-306	3.1.1-55b	A
Reactor vessel internal components not addressed in another line item	Structural support	Nickel alloy	Treated borated water Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B3.RP-24	3.1.1-87	A

Table 3.1.2-3
Reactor Coolant Pressure Boundary
Summary of Aging Management Evaluation

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel, Stainless steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-18	3.1.1-5	A
RCS pressure boundary components	Pressure boundary	Carbon steel, Carbon steel clad with stainless steel, Carbon steel clad with nickel alloy, CASS, Nickel alloy, Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-223	3.1.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity Boric Acid Corrosion	IV.C2.RP-166 IV.C2.RP-167	3.1.1-64 3.1.1-49	B A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	IV.C2.R-11	3.1.1-62	B

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity Boric Acid Corrosion	IV.C2.RP-166 IV.C2.RP-167	3.1.1-64 3.1.1-49	B A
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Cracking	Bolting Integrity	IV.C2.R-11	3.1.1-62	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	B
Flow element (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Flow element (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Flow element (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Heat exchanger coil (RCP lower oil cooler)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	V.A.EP-76	3.2.1-50	C, 102
Heat exchanger coil (RCP lower oil cooler)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-222	3.1.1-90	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger – water jacket (seal heat exchanger)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	C
Heat exchanger – water jacket (seal heat exchanger)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Heat exchanger – water jacket (seal heat exchanger)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.A.EP-93	3.2.1-31	C
Heat exchanger (channel head) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	C
Heat exchanger (channel head) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-221	3.1.1-89	C
Heat exchanger (shell) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (shell) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 102
Heat exchanger (tube sheet) (RCP upper oil cooler)	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-76	3.2.1-50	C, 102
Heat exchanger (tube sheet) (RCP upper oil cooler)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-222	3.1.1-90	C
Heat exchanger (tubes) (RCP upper oil cooler)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	V.A.EP-76	3.2.1-50	C, 102
Heat exchanger (tubes) (RCP upper oil cooler)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-222	3.1.1-90	C
Heat exchanger (tubes) (RCP motor air cooler)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	C

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes) (RCP motor air cooler)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-222	3.1.1-90	C
Heat exchanger (channel head) (RCP motor air cooler)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	C
Heat exchanger (channel head) (RCP motor air cooler)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-221	3.1.1-89	C
Heat exchanger (tube sheet) (RCP motor air cooler)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	C
Heat exchanger (tube sheet) (RCP motor air cooler)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-222	3.1.1-90	C
Orifice	Pressure boundary Flow control	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Orifice	Pressure boundary Flow control	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-37	3.1.1-45	E, 103
Orifice	Pressure boundary Flow control	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping ≥ 4" NPS	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion Nickel Alloy Inspection	IV.C2.RP-380	3.1.1-48	A
Piping ≥ 4" NPS	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30	3.1.1-33	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping ≥ 4" NPS	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping ≥ 4" NPS	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping ≥ 4" NPS	Pressure boundary	CASS	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping ≥ 4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Thermal Aging Embrittlement of CASS Water Chemistry Control – Primary and Secondary	IV.C2.R-05	3.1.1-20	E
Piping ≥ 4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping ≥ 4" NPS	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.C2.R-52	3.1.1-50	A
Piping < 4" NPS	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping < 4" NPS	Pressure boundary	CASS	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping < 4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Thermal Aging Embrittlement of CASS Water Chemistry Control – Primary and Secondary	IV.C2.R-05	3.1.1-20	E
Piping < 4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping < 4" NPS	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.C2.R-52	3.1.1-50	A
Piping ≥ 4" NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping ≥ 4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-30 IV.C2.R-56	3.1.1-33 3.1.1-35	A
Piping ≥ 4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping < 4" NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping < 4" NPS	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping < 4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection One-Time Inspection – Small-Bore Piping Water Chemistry Control – Primary and Secondary	IV.C2.RP-235	3.1.1-39	A
Piping < 4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Piping (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 101
Piping (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Piping (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping (non-Class 1) (RCP lower oil cooler)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	C
Piping (non-Class 1) (RCP lower oil cooler)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	IV.C2.RP-12	3.1.1-93	A
Piping (non-Class 1) (RCP lower oil cooler)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	IV.C2.RP-222	3.1.1-90	A
Piping (non-Class 1) RV flange leak off lines	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping (non-Class 1) RV flange leak off lines	Pressure boundary	Stainless steel	Treated borated water (int)	Cracking	One-Time Inspection	IV.A2.R-74	3.1.1-19	E
Piping (non-Class 1) RV flange leak off lines	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	One-Time Inspection	--	--	H
Pressurizer heater sheath	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-217 IV.C2.R-58	3.1.1-33 3.1.1-40	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pressurizer heater sheath	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer heater sleeve end caps	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Pressurizer heater sleeve end caps	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25 IV.C2.R-58	3.1.1-42 3.1.1-40	A
Pressurizer heater sleeve end caps	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer heater plug, heater sleeves and heater sheath to sleeve welds	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Pressurizer heater plug, heater sleeves and heater sheath to sleeve welds	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-37	3.1.1-45	E, 103
Pressurizer heater plug, heater sleeves and heater sheath to sleeve welds	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pressurizer heater internal support structure	Structural support	Nickel alloy	Treated borated water (ext)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-40	3.1.1-82	C, 101
Pressurizer heater internal support structure	Structural support	Nickel alloy	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer heater internal support structure	Structural support	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Pressurizer heater internal support structure	Structural support	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer instrument nozzle	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Pressurizer instrument nozzle	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-37	3.1.1-45	E, 103
Pressurizer instrument nozzle	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer lower head	Pressure boundary	Carbon steel clad with nickel alloy	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pressurizer lower head	Pressure boundary	Carbon steel clad with nickel alloy	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25 IV.C2.R-58	3.1.1-42 3.1.1-40	A
Pressurizer lower head	Pressure boundary	Carbon steel clad with nickel alloy	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer manway cover	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Pressurizer manway gasket retainer plate	Pressure boundary	Stainless steel	Steam (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25	3.1.1-42	A
Pressurizer manway gasket retainer plate	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer nozzles (spray nozzle, surge nozzle, safety nozzle)	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Pressurizer nozzles (spray nozzle, surge nozzle, safety nozzle)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25 IV.C2.R-58	3.1.1-42 3.1.1-40	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pressurizer nozzles (spray nozzle, surge nozzle, safety nozzle)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer shell and upper head	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Pressurizer shell and upper head	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25 IV.C2.R-58	3.1.1-42 3.1.1-40	A
Pressurizer shell and upper head	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer spray head	Flow control	Nickel alloy	Treated borated water (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-40	3.1.1-82	A, 101
Pressurizer spray head	Flow control	Nickel alloy	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pressurizer support skirt	Structural support	Carbon steel	Air – indoor (ext)	Cracking	Inservice Inspection	IV.C2.R-19	3.1.1-36	A
Pressurizer support skirt	Structural support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pressurizer welds - instrument sleeve to instrument; and nozzle to safe-end weld overlays RCS piping hot leg – overlay welds	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Pressurizer welds - instrument sleeve to instrument; and nozzle to safe-end weld overlays RCS piping hot leg – overlay welds	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-37	3.1.1-45	E, 103
Pressurizer welds - instrument sleeve to instrument; and nozzle to safe-end weld overlays RCS piping hot leg – overlay welds	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pump casing (RCP)	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing (RCP)	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A
Pump casing (RCP)	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Pump casing (RCP)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C2.R-08	3.1.1-38	A
Pump cover (RCP)	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Pump cover (RCP)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A
Pump cover (RCP)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
RCS cold leg welds	Pressure boundary	Nickel alloy (alloy 600)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
RCS cold leg welds	Pressure boundary	Nickel alloy (alloy 600)	Treated borated water (int)	Cracking	Inservice Inspection Nickel Alloy Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-159	3.1.1-45	A
RCS cold leg welds	Pressure boundary	Nickel alloy (alloy 600)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Safe end (pressurizer spray, drain, pressurizer instrument nozzles)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Safe end (pressurizer spray, drain, pressurizer instrument nozzles)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25 IV.C2.R-58	3.1.1-42 3.1.1-40	A
Safe end (pressurizer spray, drain, pressurizer instrument nozzles)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Safe end (hot leg and pressurizer surge, shutdown cooling and pressurizer safety)	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Safe end (hot leg and pressurizer surge, shutdown cooling and pressurizer safety)	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Thermal Aging Embrittlement of CASS Water Chemistry Control – Primary and Secondary	IV.C2.R-05	3.1.1-20	E
Safe end (hot leg and pressurizer surge, shutdown cooling and pressurizer safety)	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Safe end (hot leg and pressurizer surge, shutdown cooling and pressurizer safety)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	IV.C2.R-52	3.1.1-50	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Thermal sleeve (charging, SI, surge, pressurizer spray)	Structural integrity	Nickel alloy	Treated borated water (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-40	3.1.1-82	C, 101
Thermal sleeve (charging, SI, surge, pressurizer spray)	Structural integrity	Nickel alloy	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Thermowell	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Thermowell	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-159	3.1.1-45	E, 103
Thermowell	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body ≥4" NPS	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body ≥4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A
Valve body ≥4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Valve body ≥4" NPS	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C2.R-08	3.1.1-38	A
Valve body ≥4" NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body ≥4" NPS	Pressure boundary	Stainless steel	Steam (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A
Valve body ≥4" NPS	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Valve body ≥4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body ≥4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Valve body <4" NPS	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body <4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A
Valve body <4" NPS	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Valve body <4" NPS	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C2.R-08	3.1.1-38	A
Valve body <4" NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body <4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-09	3.1.1-33	A
Valve body <4" NPS	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Valve body (non-Class 1)	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body (non-Class 1)	Pressure boundary	CASS	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	C, 101
Valve body (non-Class 1)	Pressure boundary	CASS	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 101
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101

Table 3.1.2-4
Steam Generators
Summary of Aging Management Evaluation

Table 3.1.2-4: Steam Generators								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steam generator components	Pressure boundary	Carbon steel, stainless steel, nickel alloy (Alloy 690), carbon steel clad with stainless steel, carbon steel clad with nickel alloy (Alloy 690)	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-18	3.1.1-5	C
Steam generator components	Pressure boundary	Carbon steel, stainless steel, nickel alloy (Alloy 690), carbon steel clad with stainless steel, carbon steel clad with nickel alloy (Alloy 690)	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.D1.R-221 'IV.D1.R-46	3.1.1-8 3.1.1-2	A

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Steam generator components	Pressure boundary	Carbon steel, stainless steel, nickel alloy (Alloy 690)	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.D1.R-33 'IV.D1.R-46	3.1.1-5 3.1.1-2	A
Pressure boundary closure bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity Boric Acid Corrosion	IV.C2.RP-166 IV.C2.RP-167	3.1.1-64 3.1.1-49	D C
Pressure boundary closure bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.D1.RP-46	3.1.1-67	B
Tubesheet	Pressure boundary	Carbon steel clad with nickel alloy (Alloy 690)	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Tubesheet	Pressure boundary	Carbon steel clad with nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-36	3.1.1-45	E, 103
Tubesheet	Pressure boundary	Carbon steel clad with nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubesheet	Pressure boundary	Carbon steel clad with nickel alloy (Alloy 690)	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101
Tube to tubesheet weld	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-385	3.1.1-25	A
Tube to tubesheet weld	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Channel head	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy (Alloy 690)	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Channel head	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy (Alloy 690)	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.R-25	3.1.1-42	C

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Channel head	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy (Alloy 690)	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Partition plate	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.D1.RP-367	3.1.1-25	A
Partition plate	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Primary inlet and outlet nozzle transition pieces	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Primary inlet and outlet nozzle transition pieces	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-232	3.1.1-33	A
Primary inlet and outlet nozzle transition pieces	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Primary side pressure nozzle	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-378	3.1.1-106	A

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Primary side pressure nozzle	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-36	3.1.1-45	E, 103
Primary side pressure nozzle	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Inlet and outlet nozzle dam rings	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-40	3.1.1-82	C, 101
Inlet and outlet nozzle dam rings	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Primary manway drain tube	Pressure boundary	Stainless steel	Treated borated water > 140°F	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-232	3.1.1-33	C
Primary manway drain tube	Pressure boundary	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Primary manway cover	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A

Table 3.1.2-4: Steam Generators								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Primary manway insert	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Primary manway insert	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Tubes	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.R-44	3.1.1-70	A
Tubes	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Tubes	Pressure boundary	Nickel alloy (Alloy 690)	Treated water (ext)	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.R-47	3.1.1-69	A
Tubes	Pressure boundary	Nickel alloy (Alloy 690)	Treated water (ext)	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Tubes	Pressure boundary	Nickel alloy (Alloy 690)	Treated water (ext)	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-233	3.1.1-77	A

Table 3.1.2-4: Steam Generators								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubes	Heat transfer	Nickel alloy (Alloy 690)	Treated borated water (int)	None	None	--	--	H
Tubes	Heat transfer	Nickel alloy (Alloy 690)	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	--	--	H
Tube plugs	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.R-40	3.1.1-70	A
Tube plugs	Pressure boundary	Nickel alloy (Alloy 690)	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Secondary shell (elliptical head with integral steam nozzle, upper, intermediate and lower shells, transition cone)	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105
Secondary shell (elliptical head with integral steam nozzle, upper, intermediate and lower shells, transition cone)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-368	3.1.1-12	A

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow limiter insert	Flow control	Nickel alloy (Alloy 690)	Treated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.D2.R-36	3.1.1-78	C, 101
Flow limiter insert	Flow control	Nickel alloy (Alloy 690)	Treated water	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	C, 101
Feedwater nozzle	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105
Feedwater nozzle	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-368	3.1.1-12	C
Feedwater nozzle thermal sleeve	Pressure boundary	Nickel alloy (Alloy 690)	Treated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.D2.R-36	3.1.1-78	C, 101
Feedwater nozzle thermal sleeve	Pressure boundary	Nickel alloy (Alloy 690)	Treated water	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	C, 101
Instrument and sampling nozzles	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105
Instrument and sampling nozzles	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-368	3.1.1-12	C

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Blowdown nozzle	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105
Blowdown nozzle	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-368	3.1.1-12	C
Blowdown nozzle	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – FAC	Flow-Accelerated Corrosion	IV.D1.R-37	3.1.1-61	C
Secondary manway, handhole, inspection port, and recirculation nozzles	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105
Secondary manway, handhole, inspection port, and recirculation nozzles	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-368	3.1.1-12	C
Secondary manway, handhole, inspection port, and recirculation nozzle cover plates	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105

Table 3.1.2-4: Steam Generators								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Secondary manway, handhole, inspection port, and recirculation nozzle cover plates	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-368	3.1.1-12	C
Secondary manway, handhole, inspection port, and recirculation nozzle cover plates	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – erosion	Inservice Inspection	IV.D2.R-31	3.1.1-44	C
Handhole and inspection port (with seal welded diaphragms) cover plates	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105
Handhole and inspection port diaphragms	Pressure boundary	Nickel alloy (Alloy 690)	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Handhole and inspection port diaphragms	Pressure boundary	Nickel alloy (Alloy 690)	Treated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.D2.R-36	3.1.1-78	C, 101
Handhole and inspection port diaphragms	Pressure boundary	Nickel alloy (Alloy 690)	Treated water	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	C, 101
External shell attachments	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tube support plates, anti-vibration assembly bars	Structural integrity	Stainless steel	Treated water > 140°F	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	A
Tube support plates, anti-vibration assembly bars	Structural integrity	Stainless steel	Treated water > 140°F	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	A
Tube support plates, anti-vibration assembly bars	Structural integrity	Stainless steel	Treated water > 140°F	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-225	3.1.1-76	A
Wrapper barrel, associated components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-161	3.1.1-72	A
Recirculation nozzle sleeve, wrapper plug seal plates	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	C

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Recirculation nozzle sleeve, wrapper plug seal plates	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Anti-vibration assembly end caps, retaining rings, retaining bars, stayrod washer, tube support plate shim	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	A
Anti-vibration assembly end caps, retaining rings, retaining bars, stayrod washer, tube support plate shim	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	A
Anti-vibration assembly end caps, retaining rings, retaining bars, stayrod washer, tube support plate shim	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-225	3.1.1-76	A

Table 3.1.2-4: Steam Generators								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Stayrods, wedges, tube support components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	A
Stayrods, wedges, tube support components	Structural integrity	Carbon steel	Treated water	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-225	3.1.1-76	A
Feedwater header and support components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Feedwater spray nozzles, nozzle caps, filler plates	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	C
Feedwater spray nozzles, nozzle caps, filler plates	Structural integrity	Nickel alloy (Alloy 690)	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C

Table 3.1.2-4: Steam Generators								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Primary separator assembly components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Drain bucket assembly components	Structural integrity	Stainless steel	Treated water > 140°F	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	C
Drain bucket assembly components	Structural integrity	Stainless steel	Treated water > 140°F	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Lower deck components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Middle deck components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C

Table 3.1.2-4: Steam Generators

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sludge collector assembly	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Secondary separator components	Structural integrity	Carbon steel	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	C
Pedestal support	Structural support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Snubber lug, key bracket	Structural support	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 105

Table 3.1.2-5-1
Reactor Coolant System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.1.2-5-1: Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	IV.C2.RP-166	3.1.1-64	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.RP-167	3.1.1-49	A
Filter housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	V.F.EP-3	3.2.1-56	C
Filter housing	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	C, 102
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 102
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Flex hose	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-80	3.2.1-50	C, 102
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A

Table 3.1.2-5-1: Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Orifice	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-80	3.2.1-50	C, 102
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 102
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A

Table 3.1.2-5-1: Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 102
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Rupture disc	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Rupture disc	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F.EP-15	3.2.1-60	C
Sight glass	Pressure boundary	Glass	Treated borated water (int)	None	None	V.F.EP-30	3.2.1-60	C
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Sight glass	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Sight glass	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A

Table 3.1.2-5-1: Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 102
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Strainer housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	C
Tank	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C

Table 3.1.2-5-1: Reactor Coolant System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 102
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 101
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.1.2-5-2
Steam Generators
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.1.2-6: Steam Generators, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.D1.RP-46	3.1.1-67	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	IV.C2.RP-166	3.1.1-64	D
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.A.E-26	3.2.1-40	C
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E

3.2 ENGINEERED SAFETY FEATURES

3.2.1 Introduction

This section provides the results of the aging management reviews for components in the ESF systems that are subject to aging management review. The following systems are addressed in this section (system descriptions are available in the referenced sections).

- Containment Spray (Section 2.3.2.1)
- Safety Injection (Section 2.3.2.2)
- Containment Penetrations (Section 2.3.2.3)
- ESF Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.2.4)

Table 3.2.1, Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the engineered safety features component groups. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.2.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for systems in the ESF system group.

- Table 3.2.2-1 Containment Spray System—Summary of Aging Management Evaluation
- Table 3.2.2-2 Safety Injection System—Summary of Aging Management Evaluation
- Table 3.2.2-3 Containment Penetrations—Summary of Aging Management Evaluation

ESF Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.2.2-4-1 Containment Spray System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.2.2-4-2 Safety Injection System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.2.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the ESF systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.2.2.1.1 Containment Spray

Materials

Containment spray system components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with stainless steel
- Carbon steel with internal coating
- Stainless steel

Environments

Containment spray system components are exposed to the following environments.

- Air – indoor
- Lube oil
- Treated borated water
- Treated borated water > 140°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the containment spray system require management.

- Cracking
- Cracking – fatigue
- Loss of coating integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the effects of aging on the containment spray system components.

- Bolting Integrity
- Boric Acid Corrosion
- Coating Integrity
- External Surfaces Monitoring
- Oil Analysis
- One-Time Inspection

- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.2 Safety Injection

Materials

Safety injection system components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with stainless steel
- Carbon steel with internal coating
- High strength steel
- Nickel alloy
- Stainless steel

Environments

Safety injection system components are exposed to the following environments.

- Air – indoor
- Gas
- Treated borated water
- Treated borated water > 140°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the safety injection system require management.

- Cracking
- Cracking – fatigue
- Loss of coating integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the effects of aging on the safety injection system components.

- Bolting Integrity
- Boric Acid Corrosion
- Coating Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.3 Containment Penetrations

Materials

Containment penetrations components are constructed of the following materials.

- Carbon steel
- Stainless steel

Environments

Containment penetrations components are exposed to the following environments.

- Air – indoor
- Treated borated water
- Treated borated water > 140°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the containment penetrations require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the containment penetrations components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.4 ESF Systems in Scope for 10 CFR 54.4(a)(2)

The following lists encompass materials, environments, aging effects requiring management, and aging management programs for the series 3.2.2-4-x tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Carbon steel
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Treated borated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with nonsafety-related components affecting safety-related systems require management.

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Bolting Integrity
- Boric Acid Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.2.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.2.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the WF3 approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.2.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.2.2.2.2 Loss of Material due to Cladding [Breach]

This paragraph in NUREG-1800 pertains to steel charging pump casings with stainless steel cladding. Loss of material could occur for the steel casing material if exposed to treated borated water due to a cladding breach. The WF3 safety injection system pumps have solid stainless steel casings.

3.2.2.2.3 Loss of Material due to Pitting and Crevice Corrosion

1. This paragraph in NUREG-1800 pertains to loss of material due to pitting and crevice corrosion in partially encased stainless steel tanks exposed to raw water due to cracking of the perimeter seal from weathering. At WF3, ESF system tanks included in the scope of license renewal are located indoors. There are no stainless steel tanks exposed to raw water in the ESF systems.

2. Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. However, at WF3 there are no ESF system components exposed to outdoor air in the scope of license renewal. At WF3, there are no stainless steel ESF system components located indoors near unducted air intakes.

3.2.2.2.4 Loss of Material due to Erosion

Loss of material due to erosion could occur in the stainless steel pump miniflow recirculation orifice of a high-pressure safety injection (HPSI) pump used for normal charging. The HPSI pumps at WF3 are not used for normal charging.

3.2.2.2.5 Loss of Material due to General Corrosion and Fouling that Leads to Corrosion

This paragraph in NUREG-1800 applies to BWRs only.

3.2.2.2.6 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. However, at WF3 there are no ESF system components exposed to outdoor air in the scope of license renewal. At WF3, there are no stainless steel ESF system components located indoors near unducted air intakes.

3.2.2.2.7 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of WF3 quality assurance procedures and administrative controls for aging management programs.

3.2.2.2.8 Ongoing Review of Operating Experience

See Appendix B Section B.0.4 for discussion of WF3 operating experience review programs.

3.2.2.2.9 Loss of Material due to Recurring Internal Corrosion

A review of 10 years of plant operating experience identified no conditions of recurring internal corrosion (RIC) as defined in LR-ISG 2012-02, Section A, in the piping components of the engineered safety features systems in the scope of license renewal.

3.2.2.3 Time-Limited Aging Analyses

The only time-limited aging analysis identified for the ESF systems components is metal fatigue. This is evaluated in Section 4.3.

3.2.3 Conclusion

The ESF system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on ESF components are identified in Section 3.2.2.1 and in the following tables. 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 managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.2.1
Summary of Aging Management Programs for Engineered Safety Features Evaluated in Chapter V of NUREG-1801

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-1	Stainless steel, steel piping, piping components, and piping elements exposed to treated water (borated)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 “Metal Fatigue,” for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a TLAA. See Section 3.2.2.2.1.
3.2.1-2	Steel (with stainless steel cladding) pump casings exposed to treated water (borated)	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated Reference NRC Information Notice 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant-specific program addresses clad breach	The WF3 safety injection system pump casings are solid stainless steel. See Section 3.2.2.2.2.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-3	Stainless steel partially-encased tanks with breached moisture barrier exposed to raw water	Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated for pitting and crevice corrosion of tank bottom because moisture and water can egress under the tank due to cracking of the perimeter seal from weathering.	Yes, plant-specific	There are no stainless steel tanks exposed to raw water in the EFW systems in the scope of license renewal. See Section 3.2.2.2.3, Item 1.
3.2.1-4	Stainless steel piping, piping components, and piping elements; tanks exposed to Air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	There are no ESF system components exposed to outdoor air in the scope of license renewal. See Section 3.2.2.2.3, Item 2.
3.2.1-5	Stainless steel orifice (miniflow recirculation) exposed to treated water (borated)	Loss of material due to erosion	A plant-specific aging management program is to be evaluated for erosion of the orifice due to extended use of the centrifugal HPSI pump for normal charging. See LER 50-275/94-023 for evidence of erosion.	Yes, plant-specific	The WF3 HPSI pumps are not used for normal charging. See Section 3.2.2.2.4.
3.2.1-6	BWR only				

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-7	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	There are no ESF system components exposed to outdoor air in the scope of license renewal. See Section 3.2.2.2.6.
3.2.1-8	Aluminum, copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No	There are no aluminum or copper alloy ESF components exposed to air with borated water leakage, in the scope of license renewal.
3.2.1-9	Steel external surfaces, bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, "Boric Acid Corrosion"	No	Consistent with NUREG-1801. Loss of material for steel external surfaces and bolting exposed to air with borated water leakage is managed by the Boric Acid Corrosion Program.
3.2.1-10	Cast austenitic stainless steel piping, piping components, and piping elements exposed to treated water (borated) >250°C (>482°F), treated water >250°C (>482°F)	Loss of fracture toughness due to thermal aging embrittlement	Chapter XI.M12, "Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)"	No	There are no CASS components exposed to water > 482°F in the ESF systems.
3.2.1-11	BWR only				

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-12	Steel, high-strength closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Cracking of high strength steel bolting exposed to air with steam or water leakage is managed by the Bolting Integrity Program.
3.2.1-13	Steel; stainless steel bolting, closure bolting exposed to air – outdoor (external), air – indoor, uncontrolled (external)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material for steel closure bolting exposed to indoor air is managed by the Bolting Integrity Program. Loss of material is not an aging effect for stainless steel closure bolting in indoor air unless exposed to prolonged leakage (an event driven condition). Nevertheless, the Bolting Integrity Program also applies to stainless steel bolting exposed to indoor air.
3.2.1-14	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity"	No	As stated in Item Number 3.2.1-13, loss of material of steel bolting exposed to air in the ESF systems is managed by the Bolting Integrity Program. However, steam or water leakage is not considered as a separate aspect of the indoor air environment.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-15	Copper alloy, nickel alloy, steel; stainless steel, stainless steel, steel; stainless steel bolting, closure bolting exposed to any environment, air – outdoor (external), raw water, treated borated water, fuel oil, treated water, air – indoor, uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload for steel and stainless steel bolting is managed by the Bolting Integrity Program. There is no copper alloy or nickel alloy bolting included in the scope of license renewal for ESF systems.
3.2.1-16	Steel containment isolation piping and components (internal surfaces), piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Loss of material for steel containment isolation components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. However, these steel containment isolation components were evaluated as part of their respective systems and were compared to other NUREG-1801 line items.
3.2.1-17	BWR only				

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-18	Stainless steel containment isolation piping and components (internal surfaces) exposed to treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Loss of material for stainless steel components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. However, these stainless steel containment isolation components were evaluated as part of their respective systems and were compared to other NUREG-1801 line items.
3.2.1-19	Stainless steel heat exchanger tubes exposed to treated water, treated water (borated)	Reduction of heat transfer due to fouling	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Reduction of heat transfer for stainless steel heat exchanger tubes exposed to treated borated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage reduction of heat transfer.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-20	Stainless steel piping, piping components, and piping elements; tanks exposed to treated water (borated) >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Cracking of stainless steel components exposed to treated borated water >140°F is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage cracking.
3.2.1-21	Steel (with stainless steel or nickel-alloy cladding) safety injection tank (accumulator) exposed to treated water (borated) >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	The WF3 safety injection tanks are maintained at containment ambient conditions (<140°F).
3.2.1-22	Stainless steel piping, piping components, and piping elements; tanks exposed to treated water (borated)	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to treated borated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-23	Steel heat exchanger components, containment isolation piping and components (internal surfaces) exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no steel ESF components exposed to raw water in the scope of license renewal.
3.2.1-24	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no stainless steel ESF components exposed to raw water in the scope of license renewal.
3.2.1-25	Stainless steel heat exchanger components, containment isolation piping and components (internal surfaces) exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no stainless steel ESF components exposed to raw water in the scope of license renewal.
3.2.1-26	BWR only				
3.2.1-27	Stainless steel, steel heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no steel or stainless steel ESF components exposed to raw water in the scope of license renewal.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-28	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no stainless steel ESF components exposed to closed-cycle cooling water >140°F in the scope of license renewal.
3.2.1-29	Steel piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no steel ESF components exposed to closed-cycle cooling water in the scope of license renewal, other than the heat exchanger components compared to item 3.2.1-30 below.
3.2.1-30	Steel heat exchanger components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material of steel heat exchanger components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.2.1-31	Stainless steel heat exchanger components, piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material of stainless steel components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-32	Copper alloy heat exchanger components, piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no copper alloy ESF system components exposed to closed-cycle cooling water in the scope of license renewal.
3.2.1-33	Copper alloy, stainless steel Heat exchanger tubes exposed to closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Reduction of heat transfer for stainless steel ESF system heat exchanger tubes exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program. There are no copper alloy ESF heat exchanger tubes exposed to closed-cycle cooling water in the scope of license renewal.
3.2.1-34	Copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements, heat exchanger components exposed to closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	There are no copper alloy (>15% Zn or >8% Al) ESF system components exposed to closed-cycle cooling water in the scope of license renewal.
3.2.1-35	Gray cast iron motor cooler exposed to treated water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	There are no gray cast iron ESF system components exposed to closed-cycle cooling water in the scope of license renewal.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-36	Gray cast iron piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	There are no gray cast iron ESF system components exposed to closed-cycle cooling water in the scope of license renewal.
3.2.1-37	Gray cast iron piping, piping components, and piping elements exposed to soil	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	There are no gray cast iron ESF system components exposed to soil in the scope of license renewal.
3.2.1-38	BWR only				
3.2.1-39	Steel containment isolation piping and components (external surfaces) exposed to condensation (external)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Loss of material for steel components externally exposed to condensation is managed by the External Surfaces Monitoring Program. However, these steel containment isolation components were evaluated as part of their respective systems and were compared to other NUREG-1801 line items.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-40	Steel ducting, piping, and components (external surfaces), ducting, closure bolting, containment isolation piping and components (external surfaces) exposed to air – indoor, uncontrolled (external)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material of external surfaces of steel components exposed to indoor air is managed by the External Surfaces Monitoring Program.
3.2.1-41	Steel external surfaces exposed to air – outdoor (external)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no steel ESF system components exposed to outdoor air in the scope of license renewal.
3.2.1-42	Aluminum piping, piping components, and piping elements exposed to air - outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no aluminum ESF system components exposed to outdoor air in the scope of license renewal.
3.2.1-43	BWR only				

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-44	Steel piping and components (internal surfaces), ducting and components (internal surfaces) exposed to air – indoor, uncontrolled (internal)	Loss of material due to general corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 for many components. Loss of material from the internal surfaces of steel components exposed to air – indoor is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. For the fire protection system portable smoke exhaust fan housing (Table 3.3.2-6), and for abandoned piping in the secondary sampling system (Table 3.3.2-15-34), loss of material from the internal surface is managed by the Periodic Surveillance and Preventive Maintenance Program. The External Surfaces Monitoring Program manages loss of material for external carbon steel components by visual inspection of external surfaces.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
					(continued) For those components where internal carbon steel surfaces are exposed to the same environment as external surfaces (Tables 3.3.2-X), external surface conditions will be representative of internal surfaces. Thus, loss of material on internal carbon steel surfaces is also managed by the External Surfaces Monitoring Program.
3.2.1-45	Steel encapsulation components exposed to air – indoor, uncontrolled (internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	The WF3 containment spray system does not use encapsulation components.
3.2.1-46	BWR only				
3.2.1-47	Steel encapsulation components exposed to air with borated water leakage (internal)	Loss of material due to general, pitting, crevice, and boric acid corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	The WF3 containment spray system does not use encapsulation components.
3.2.1-48	Stainless steel piping, piping components, and piping elements (internal surfaces); tanks exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no stainless steel ESF system components internally exposed to condensation in the scope of license renewal.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-49	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.
3.2.1-50	Copper alloy, stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for copper alloy and stainless steel components exposed to lube oil (Tables 3.1.2-X) is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-51	Steel, copper alloy, stainless steel heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Reduction of heat transfer for steel, and stainless steel heat exchanger tubes exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage reduction of heat transfer. There are no copper alloy heat exchanger tubes with an intended function of heat transfer in the ESF systems in the scope of license renewal.
3.2.1-52	Steel (with coating or wrapping) piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no steel ESF system components exposed to soil or concrete in the scope of license renewal.
3.2.1-53	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no ESF system piping components exposed to soil or concrete in the scope of license renewal.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-53.5	Steel; stainless steel, nickel alloy underground piping, piping components, and piping elements exposed to air-indoor uncontrolled or condensation (external)	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no ESF system underground piping components in the scope of license renewal.
3.2.1-54	BWR only				
3.2.1-55	Steel piping, piping components, and piping elements exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	There are no ESF system components embedded in concrete in the scope of license renewal.
3.2.1-56	Aluminum piping, piping components, and piping elements exposed to air – indoor, uncontrolled (internal/external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801. This item applies to components in Table 3.1.2-5-1.
3.2.1-57	Copper alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external), gas	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air) environments. This item applies to components in Table 3.1.2-3.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-58	Copper alloy (≤15% Zn and ≤8% Al) piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA - No AEM or AMP	There are no copper alloy ESF system components exposed to air with borated water leakage in the scope of license renewal.
3.2.1-59	Galvanized steel ducting, piping, and components exposed to air – indoor, controlled (external)	None	None	NA - No AEM or AMP	Galvanized steel is evaluated as steel.
3.2.1-60	Glass piping elements exposed to air – indoor, uncontrolled (external), lubricating oil, raw water, treated water, treated water (borated), air with borated water leakage, condensation (internal/external), gas, closed-cycle cooling water, air – outdoor	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air and treated borated water) environments. This item applies to components in Table 3.1.2-5-1.
3.2.1-61	Nickel alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.
3.2.1-62	Nickel alloy piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-63	Stainless steel piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external), air with borated water leakage, concrete, gas, air – indoor, uncontrolled (internal)	None	None	NA - No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air, air with borated water leakage and gas) environments.
3.2.1-64	Steel piping, piping components, and piping elements exposed to air – indoor, controlled (external), gas	None	None	NA - No AEM or AMP	There are no steel ESF system components exposed to controlled indoor air or gas in the scope of license renewal.
3.2.1-65	Any material, piping, piping components, and piping elements exposed to treated water, treated water (borated)	Wall thinning due to erosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	The materials, environments and operating conditions of ESF system components are not conducive to erosion.
3.2.1-66	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific	Recurring internal corrosion was not identified in the WF3 engineered safety features systems in the scope of license renewal. See Section 3.2.2.2.9.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-67	Stainless steel or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Cracking due to stress corrosion cracking	Chapter XI.M29, “Aboveground Metallic Tanks”	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank constructed on soil or concrete in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.
3.2.1-68	Steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank constructed on soil or concrete in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-69	Insulated steel, stainless steel, copper alloy, or aluminum, piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy only), pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks," (for tanks only)	No	Consistent with NUREG-1801 for insulated stainless steel components exposed to condensation. Loss of material is managed by the External Surfaces Monitoring Program. There are no insulated aluminum or copper alloy > 15% Zn or > 8% Al piping components or tanks exposed to condensation or outdoor air in the WF3 engineered safety features systems in the scope of license renewal.
3.2.1-70	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water, treated borated water	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-71	Insulated stainless steel, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, “Aboveground Metallic Tanks,” (for tanks only)	No	Consistent with NUREG-1801 for insulated stainless steel components exposed to condensation. Cracking is managed by the External Surfaces Monitoring Program. There are no insulated aluminum or copper alloy > 15% Zn or > 8% Al piping components or tanks exposed to condensation or outdoor air in the WF3 engineered safety features systems in the scope of license renewal.
3.2.1-72	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-1801. Loss of coating or lining integrity for metallic components with internal coating or linings is managed by the Coating Integrity Program.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-73	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-1801. Loss of material for metallic components with internal coating or linings is managed by the Coating Integrity Program.
3.2.1-74	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	There are no gray cast iron components with internal coatings or linings in the ESF systems in the scope of license renewal.

Notes for Tables 3.2.2-1 through 3.2.2-4-2

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

201. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

202. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

Table 3.2.2-1
Containment Spray System
Summary of Aging Management Evaluation

Table 3.2.2-1: Containment Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E.EP-70	3.2.1-13	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.E.E-41	3.2.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Heat exchanger (channel head)	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.A.E-28	3.2.1-9	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	C, 201

Table 3.2.2-1: Containment Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (channel head)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.A.E-28	3.2.1-9	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.A.EP-92	3.2.1-30	A
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of coating integrity	Coating Integrity	V.A.E-401	3.2.1-72	B
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of material	Coating Integrity	V.A.E-414	3.2.1-73	B
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	C, 201
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201

Table 3.2.2-1: Containment Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel clad with stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.A.EP-93	3.2.1-31	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	V.A.E-20	3.2.1-19	A, 201
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	C, 201
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water > 140°F (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	V.A.E-20	3.2.1-19	A, 201
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.A.EP-93	3.2.1-31	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	V.A.EP-96	3.2.1-33	A

Table 3.2.2-1: Containment Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (water jacket)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.A.E-28	3.2.1-9	A
Heat exchanger (water jacket)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Heat exchanger (water jacket)	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 202
Heat exchanger (water jacket)	Heat transfer	Carbon steel	Lube oil (ext)	Reduction of heat transfer	Oil Analysis	V.A.EP-75	3.2.1-51	A, 202
Heat exchanger (water jacket)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.A.EP-92	3.2.1-30	A
Heat exchanger (water jacket)	Heat transfer	Carbon steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.F1.AP-204	3.3.1-50	C
Nozzle	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Nozzle	Pressure boundary Flow control	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-1: Containment Spray System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	A, 201
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	C
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Separator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-1: Containment Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Separator	Pressure boundary Filtration	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	A, 201
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	C
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	A, 201
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	C

Table 3.2.2-1: Containment Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	A, 201
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	C
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201

Table 3.2.2-2
Safety Injection System
Summary of Aging Management Evaluation

Table 3.2.2-2: Safety Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E.EP-70	3.2.1-13	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.E.E-41	3.2.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	V.E.E-03	3.2.1-12	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E.EP-70	3.2.1-13	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Flow element	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Flow element	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201

Table 3.2.2-2: Safety Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201
Flow element	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	A
Flow element	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of coating integrity	Coating Integrity	V.D.1.E-401	3.2.1-72	B
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of material	Coating Integrity	V.D1.E-414	3.2.1-73	B
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	C, 201
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	V.D1.E-20	3.2.1-19	A, 201

Table 3.2.2-2: Safety Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-93	3.2.1-31	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-96	3.2.1-33	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-2: Safety Injection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F.EP-22	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	A
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Pump casing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201

Table 3.2.2-2: Safety Injection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Tank	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Tank	Pressure boundary	Carbon steel clad with stainless steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Tank	Pressure boundary	Carbon steel clad with stainless steel	Gas (int)	None	None	V.F.EP-22	3.2.1-63	C
Tank	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Thermowell	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	V.F.EP-17 V.F.EP-115	3.2.1-61 3.2.1-62	A
Thermowell	Pressure boundary	Nickel alloy	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201

Table 3.2.2-2: Safety Injection System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	A
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F.EP-22	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	A
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201

Table 3.2.2-3
Containment Penetrations
Summary of Aging Management Evaluation

Table 3.2.2-3: Containment Penetrations								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E.EP-70	3.2.1-13	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	Stainless steel	Treated borated water (ext)	Loss of material	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Stainless steel	Treated borated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-120	3.2.1-15	B
Insulated piping components	Pressure boundary	Stainless steel	Condensation (ext)	Cracking	External Surfaces Monitoring	V.C.E-406	3.2.1-71	A
Insulated piping components	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	V.C.E-403	3.2.1-69	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-3: Containment Penetrations								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	C, 201
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	C
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	C, 201
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.C.EP-95	3.2.1-31	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E

Table 3.2.2-3: Containment Penetrations								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	C, 201
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	C
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	C, 201
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.C.EP-95	3.2.1-31	A

Table 3.2.2-4-1
Containment Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-4-1:Containment Spray System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E.EP-70	3.2.1-13	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.E.E-41	3.2.1-9	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Orifice	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.2.2-4-1:Containment Spray System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	A, 201
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.2.2-4-2
Safety Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-4-2:Safety Injection System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	V.E.EP-70	3.2.1-13	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.E.E-41	3.2.1-9	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-4-2:Safety Injection System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Trap	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

3.3 AUXILIARY SYSTEMS

3.3.1 Introduction

This section provides the results of the aging management reviews for those components in the auxiliary systems which are subject to aging management review. The following systems are addressed in this section (system descriptions are available in the referenced sections).

- Chemical and Volume Control (Section 2.3.3.1)
- Chilled Water (Section 2.3.3.2)
- Component Cooling and Auxiliary Component Cooling Water (Section 2.3.3.3)
- Compressed Air (Section 2.3.3.4)
- Containment Cooling HVAC (Section 2.3.3.5)
- Control Room HVAC (Section 2.3.3.6)
- Emergency Diesel Generator (Section 2.3.3.7)
- Fire Protection – Water (Section 2.3.3.8)
- Fire Protection RCP Oil Collection (Section 2.3.3.9)
- Fuel Pool Cooling and Purification (Section 2.3.3.10)
- Nitrogen (Section 2.3.3.11)
- Miscellaneous HVAC (Section 2.3.3.12)
- Auxiliary Diesel Generator (Section 2.3.3.13)
- Plant Drains (Section 2.3.3.14)
- Auxiliary Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.3.15)

Table 3.3.1, Summary of Aging Management Programs for Auxiliary Systems Evaluated in Chapter VII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the auxiliary systems component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.3.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for auxiliary systems.

- Table 3.3.2-1 Chemical and Volume Control System—Summary of Aging Management Evaluation
- Table 3.3.2-2 Chilled Water System—Summary of Aging Management Evaluation
- Table 3.3.2-3 Component Cooling and Auxiliary Component Cooling Water System—Summary of Aging Management Evaluation
- Table 3.3.2-4 Compressed Air System—Summary of Aging Management Evaluation
- Table 3.3.2-5 Containment Cooling HVAC System—Summary of Aging Management Evaluation

- Table 3.3.2-6 Control Room HVAC System—Summary of Aging Management Evaluation
- Table 3.3.2-7 Emergency Diesel Generator System—Summary of Aging Management Evaluation
- Table 3.3.2-8 Fire Protection – Water System—Summary of Aging Management Evaluation
- Table 3.3.2-9 Fire Protection RCP Oil Collection System—Summary of Aging Management Evaluation
- Table 3.3.2-10 Fuel Pool Cooling and Purification System—Summary of Aging Management Evaluation
- Table 3.3.2-11 Nitrogen System—Summary of Aging Management Evaluation
- Table 3.3.2-12 Miscellaneous HVAC Systems—Summary of Aging Management Evaluation
- Table 3.3.2-13 Auxiliary Diesel Generator System—Summary of Aging Management Evaluation
- Table 3.3.2-14 Plant Drains —Summary of Aging Management Evaluation

Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.3.2-15-1 Air Evacuation System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-2 Airborne Radioactivity Removal System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-3 Annulus Negative Pressure System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-4 Auxiliary Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-5 Boric Acid Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-15-6 Boron Management System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-7 Chemical and Volume Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-8 Chemical Feed System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-9 Chilled Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-10 Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-11 Component Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-12 Compressed Air System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-13 Containment Atmosphere Purge System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-14 Containment Atmosphere Release System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-15 Containment Building, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-16 Decontamination Facility, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-17 Emergency Diesel Generator System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-15-18 Fuel Handling Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-19 Fuel Pool Cooling and Purification System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-20 Gaseous Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-21 Hot Machine Shop and Decon Facility Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-22 Leak Rate Testing System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-23 Liquid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-24 Nitrogen System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-25 Post Accident Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-26 Potable Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-27 Primary Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-28 Primary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-29 Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-15-30 Reactor Auxiliary Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-31 Reactor Cavity Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-32 Resin Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-33 Secondary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-34 Solid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-35 Sump Pump System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-15-36 Turbine Building Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.3.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the auxiliary systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.3.2.1.1 Chemical and Volume Control

Materials

Chemical and volume control system components are constructed of the following materials.

- Carbon steel
- CASS
- High strength steel
- Stainless steel

Environments

Chemical and volume control system components are exposed to the following environments.

- Air – indoor
- Gas
- Lube oil
- Treated borated water
- Treated borated water > 140°F
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the chemical and volume control system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for chemical and volume control system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Inservice Inspection
- Oil Analysis
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.3.2.1.2 Chilled Water

Materials

Chilled water system components are constructed of the following materials.

- Carbon steel

- Carbon steel with internal coating
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Glass
- Stainless steel

Environments

Chilled water system components are exposed to the following environments.

- Air – indoor
- Condensation
- Gas
- Lube oil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the chilled water system require management.

- Loss of coating integrity
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the chilled water system components.

- Bolting Integrity
- Coating Integrity
- External Surfaces Monitoring
- Oil Analysis
- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.3 Component Cooling and Auxiliary Component Cooling Water

Materials

Component cooling and auxiliary component cooling water system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Carbon steel with internal coating
- Concrete
- Copper alloy
- Glass
- Gray cast iron
- High strength steel
- Stainless steel

Environments

Component cooling and auxiliary component cooling water system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Lube oil
- Raw water
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the component cooling and auxiliary component cooling water system require management.

- Change in material properties
- Cracking
- Loss of coating integrity
- Loss of material
- Loss of material – erosion
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the component cooling and auxiliary component cooling water system components.

- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection

- Coating Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.4 Compressed Air

Materials

Compressed air system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Copper alloy
- Elastomer
- Plastic
- Stainless steel

Environments

Compressed air system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation

Aging Effects Requiring Management

The following aging effects associated with the compressed air system require management.

- Cracking
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the compressed air system components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring

3.3.2.1.5 Containment Cooling HVAC

Materials

Containment cooling HVAC system components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Elastomer
- Stainless steel

Environments

Containment cooling HVAC system components are exposed to the following environments.

- Air – indoor
- Condensation
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the containment cooling HVAC system require management.

- Change in material properties
- Cracking
- Loss of material
- Loss of material – wear
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the containment cooling HVAC system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.6 Control Room HVAC

Materials

Control room HVAC system components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Elastomer
- Stainless steel

Environments

Control room HVAC system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the control room HVAC system require management.

- Change in material properties
- Cracking
- Loss of material
- Loss of material – wear
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the control room HVAC system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.7 Emergency Diesel Generator

Materials

Emergency diesel generator system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Carbon steel with internal coating
- Copper alloy
- Copper alloy > 15% zinc (inhibited)
- Copper alloy > 15% zinc or > 8% aluminum
- Glass
- Stainless steel

Environments

Emergency diesel generator system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Exhaust gas
- Fuel oil
- Lube oil
- Soil
- Treated water
- Treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the emergency diesel generator system require management.

- Cracking
- Cracking – fatigue
- Loss of coating integrity
- Loss of material
- Loss of material – wear
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the emergency diesel generator system components.

- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection
- Coating Integrity
- Compressed Air Monitoring
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.8 Fire Protection – Water

Materials

Fire protection – water system components are constructed of the following materials.

- Carbon steel
- Carbon steel with internal coating
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Gray cast iron
- Plastic (polyvinyl chloride [PVC])
- Stainless steel

Environments

Fire protection – water system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Exhaust gas
- Fuel oil
- Raw water
- Soil
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the fire protection – water system require management.

- Cracking – fatigue
- Loss of coating integrity
- Loss of material
- Loss of preload
- Recurring internal corrosion
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the fire protection – water system components.

- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Fire Water System
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.9 Fire Protection RCP Oil Collection

Materials

Fire protection RCP oil collection system components are constructed of the following materials.

- Carbon steel
- Glass
- Stainless steel

Environments

Fire protection RCP oil collection system components are exposed to the following environments.

- Air – indoor
- Lube oil

Aging Effects Requiring Management

The following aging effects associated with the fire protection RCP oil collection system require management.

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the fire protection RCP oil collection system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance

3.3.2.1.10 Fuel Pool Cooling and Purification

Materials

Fuel pool cooling and purification system components are constructed of the following materials.

- Boral

- Carbon steel
- Stainless steel

Environments

Fuel pool cooling and purification system components are exposed to the following environments.

- Air – indoor
- Treated borated water
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the fuel pool cooling and purification system require management.

- Change in material properties
- Loss of material
- Loss of preload
- Reduction in neutron absorption capacity
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the fuel pool cooling and purification system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Neutron-Absorbing Material Monitoring
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.3.2.1.11 Nitrogen

Materials

Nitrogen system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Stainless steel

Environments

Nitrogen system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Gas
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the nitrogen system require management.

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the nitrogen system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components

3.3.2.1.12 Miscellaneous HVAC

Materials

Miscellaneous HVAC systems components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Elastomer
- Glass
- High strength steel
- Stainless steel

Environments

Miscellaneous HVAC systems components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the miscellaneous HVAC systems require management.

- Change in material properties
- Cracking
- Loss of material
- Loss of material – wear
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the miscellaneous HVAC systems components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.13 Auxiliary Diesel Generator

Materials

Auxiliary diesel generator system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Carbon steel with internal coating

- Gray cast iron
- Stainless steel

Environments

Auxiliary diesel generator system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Exhaust gas
- Fuel oil

Aging Effects Requiring Management

The following aging effects associated with the auxiliary diesel generator system require management.

- Cracking
- Cracking – fatigue
- Loss of coating integrity
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the auxiliary diesel generator system components.

- Bolting Integrity
- Coating Integrity
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components

3.3.2.1.14 Plant Drains

Materials

Plant drain components are constructed of the following materials.

- Carbon steel
- Copper alloy

- Copper alloy > 15% zinc or > 8% aluminum
- Gray cast iron
- Stainless steel

Environments

Plant drain components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Soil
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the plant drains require management.

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the plant drain components.

- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Water Chemistry Control – Primary and Secondary

3.3.2.1.15 Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

The following lists encompass materials, environments, aging effects requiring management, and aging management programs for the series 3.3.2-15-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Aluminum
- Carbon steel
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Glass
- Gray cast iron
- Plastic
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Gas
- Lube oil
- Raw water
- Steam
- Treated borated water
- Treated borated water > 140°F
- Treated water
- Treated water > 140°F
- Waste water

Aging Effects Requiring Management

The following aging effects associated with nonsafety-related components affecting safety-related systems require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – FAC
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Bolting Integrity
- Boric Acid Corrosion
- Compressed Air Monitoring
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.3.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.3.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the WF3 approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.3.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management for components, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluations of these TLAAs are addressed in Sections 4.3 and 4.7.

3.3.2.2.2 Cracking due to Stress Corrosion Cracking and Cyclic Loading

Cracking due to SCC and cyclic loading in stainless steel PWR non-regenerative heat exchanger components exposed to treated borated water greater than 140°F in the chemical and volume control system is an aging effect requiring management. The Water Chemistry Control – Primary and Secondary Program manages cracking of stainless steel non-regenerative heat exchanger components exposed to treated borated water. The program is augmented by the One-Time Inspection Program which will verify the absence of cracking through the use of visual and volumetric NDE techniques. Absence of cracking of the tubes and tubesheet is also verified by monitoring RCS leakage and radiation levels in the component cooling water system. Temperature monitoring is a much less sensitive technique and is not used.

3.3.2.2.3 Cracking due to Stress Corrosion Cracking

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. Consistent with NUREG-1801, cracking of stainless steel components exposed to outdoor air, including indoor components accessible to outdoor air, is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program.

3.3.2.2.4 Loss of Material due to Cladding Breach

This paragraph in NUREG-1800 pertains to steel charging pump casings with stainless steel cladding. Loss of material could occur for the steel casing material if exposed to treated borated water due to a cladding breach. The WF3 charging pumps have solid stainless steel casings.

3.3.2.2.5 Loss of Material due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. Consistent with NUREG-1801, loss of material for stainless steel components exposed to outdoor air, including indoor components accessible to outdoor air, is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program.

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of WF3 quality assurance procedures and administrative controls for aging management programs.

3.3.2.2.7 Ongoing Review of Operating Experience

See Appendix B Section B.0.4 for discussion of WF3 operating experience review programs.

3.3.2.2.8 Loss of Material due to Recurring Internal Corrosion

A review of 10 years of plant operating experience identified recurring internal corrosion (RIC) as defined in LR-ISG 2012-02, Section A, in carbon steel piping exposed to raw water due to multiple corrosion mechanisms. The Fire Water System

Program will manage loss of material for these piping components by monitoring degradation and replacing pipe where necessary.

The Fire Water System Program will conduct augmented flow tests or flushing, and wall thickness measurements for fire water piping experiencing recurring internal corrosion prior to the period of extended operation and at least once every refueling cycle during the period of extended operation. Wall thickness measurements at selected locations will provide a representative sample of the type of piping and environment where the recurring corrosion is occurring. The selected locations may change based the relevance and usefulness of the wall thickness measurements.

3.3.2.3 Time-Limited Aging Analysis

The only time-limited aging analysis identified for auxiliary systems components is metal fatigue. This is evaluated in Section 4.3.

3.3.3 Conclusion

The auxiliary system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on auxiliary system components are identified in Section 3.3.2.1 and in the following tables. 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 system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.3.1
Summary of Aging Management Programs for Auxiliary Systems
Evaluated in Chapter VII of NUREG-1801

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-1	Steel cranes - structural girders exposed to air – indoor uncontrolled (external)	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation for structural girders of cranes that fall within the scope of 10 CFR 54 (Standard Review Plan, Section 4.7, "Other Plant- Specific Time-Limited Aging Analyses," for generic guidance for meeting the requirements of 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. Steel cranes are evaluated as structural components in Section 3.5. See Section 3.3.2.2.1.
3.3.1-2	Stainless steel, steel heat exchanger components and tubes, piping, piping components, and piping elements exposed to treated borated water, air - indoor, uncontrolled, treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a TLAA. See Section 3.3.2.2.1.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-3	Stainless steel heat exchanger components, non-regenerative exposed to treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M2, “Water Chemistry” The AMP is to be augmented by verifying the absence of cracking due to stress corrosion cracking and cyclic loading. An acceptable verification program is to include temperature and radioactivity monitoring of the shell side water, and eddy current testing of tubes.	Yes, plant-specific	The Water Chemistry Control – Primary and Secondary Program manages cracking of stainless steel non-regenerative heat exchanger components exposed to treated borated water. The program is augmented by the One-Time Inspection Program which will verify the absence of cracking. Absence of cracking of the tubes and tubesheet is also verified by additional monitoring. See Section 3.3.2.2.2.
3.3.1-4	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Consistent with NUREG-1801. Cracking in stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program. See Section 3.3.2.2.3.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-5	Steel (with stainless steel or nickel-alloy cladding) pump casings exposed to treated borated water	Loss of material due to cladding breach	A plant-specific aging management program is to be evaluated. Reference NRC Information Notice 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant-specific program addresses clad cracking	The WF3 charging pump casings are solid stainless steel. See Section 3.3.2.2.4.
3.3.1-6	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Consistent with NUREG-1801. Loss of material in stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program. See Section 3.3.2.2.5.
3.3.1-7	Stainless steel high-pressure pump, casing exposed to treated borated water	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-1801. Cracking of the stainless steel charging pump casings due to cyclic loading is managed by the Inservice Inspection Program.
3.3.1-8	Stainless steel heat exchanger components and tubes exposed to treated borated water >60°C (>140°F)	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD"	No	Consistent with NUREG-1801. Cracking of stainless steel heat exchanger components exposed to treated borated water >60°C (>140°F) is managed by the Inservice Inspection Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-9	Steel, aluminum, copper alloy (>15% Zn or >8% Al) external surfaces, piping, piping components, and piping elements, bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. Loss of material due to boric acid corrosion of steel external surfaces is managed by the Boric Acid Corrosion Program. There are no aluminum or copper alloy (>15% Zn or >8% Al) auxiliary system components exposed to air with borated water leakage within the scope of license renewal.
3.3.1-10	Steel, high-strength steel closure bolting exposed to air with steam or water leakage.	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M18, “Bolting Integrity”	No	Consistent with NUREG-1801. Cracking of high strength steel closure bolting is managed by the Bolting Integrity Program.
3.3.1-11	Steel, high-strength high-pressure pump, closure bolting exposed to air with steam or water leakage	Cracking due to stress corrosion cracking; cyclic loading	Chapter XI.M18, “Bolting Integrity”	No	Consistent with NUREG-1801. Cracking of high strength steel, pump closure bolting is managed by the Bolting Integrity Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-12	Steel; stainless steel closure bolting, bolting exposed to condensation, air – indoor, uncontrolled (external), air – outdoor (external)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, “Bolting Integrity”	No	Consistent with NUREG-1801. Loss of material for steel and stainless steel bolting is managed by the Bolting Integrity Program. Loss of material is not an aging effect for stainless steel closure bolting in indoor air unless exposed to prolonged leakage (an event driven condition). Nevertheless, the Bolting Integrity Program also applies to stainless steel bolting exposed to indoor air.
3.3.1-13	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, “Bolting Integrity”	No	As stated in Item 3.3.1-12, loss of material of steel bolting exposed to air in the auxiliary systems is managed by the Bolting Integrity Program. However, steam or water leakage is not considered as a separate aspect of the indoor air environment.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-14	Steel, stainless steel bolting exposed to soil	Loss of preload	Chapter XI.M18, “Bolting Integrity”	No	Consistent with NUREG-1801. Loss of preload for steel bolting exposed to soil is managed by the Bolting Integrity Program. There is no stainless steel bolting exposed to soil in the auxiliary systems in scope for license renewal.
3.3.1-15	Steel; stainless steel, copper alloy, nickel alloy, stainless steel closure bolting, bolting exposed to air – indoor, uncontrolled (external), any environment, air – outdoor (external), raw water, treated borated water, fuel oil, treated water	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, “Bolting Integrity”	No	Consistent with NUREG-1801. Loss of preload for steel and stainless steel bolting exposed to relevant (indoor and outdoor air) environments is managed by the Bolting Integrity Program. There is no copper alloy or nickel alloy bolting in the auxiliary systems in scope for license renewal.
3.3.1-16	BWR only				

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-17	Stainless steel heat exchanger tubes exposed to treated water, treated water (borated)	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Reduction of heat transfer for stainless steel heat exchanger tubes exposed to treated borated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.
3.3.1-18	Stainless steel high-pressure pump, casing, piping, piping components, and piping elements exposed to treated borated water >60°C (>140°F), sodium pentaborate solution >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	The operating temperature of the centrifugal charging pumps of the chemical and volume control system is below the 140°F threshold for cracking in stainless steel.
3.3.1-19	Stainless steel regenerative heat exchanger components exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Stainless steel regenerative heat exchanger components are exposed to treated borated water >60°C (>140°F), and are addressed in Item 3.3.1-20.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-20	Stainless steel, steel with stainless steel cladding heat exchanger components exposed to treated borated water >60°C (>140°F), treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Cracking of stainless steel components exposed to treated borated water >60°C (>140°F) is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage cracking.
3.3.1-21	BWR only				
3.3.1-22	BWR only				
3.3.1-23	Aluminum piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	There are no aluminum auxiliary systems components exposed to treated water within the scope of license renewal.
3.3.1-24	BWR only				
3.3.1-25	BWR only				
3.3.1-26	Steel with stainless steel cladding piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion (only after cladding degradation)	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	There are no steel piping components in the WF3 fuel pool cooling system exposed to treated water within the scope of license renewal.
3.3.1-27	BWR only				

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-28	Stainless steel piping, piping components, and piping elements; tanks, exposed to treated borated water (primary oxygen levels controlled) >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801 for stainless steel components exposed to treated borated water >60°C (>140°F). Cracking for these components is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage cracking.
3.3.1-29	Steel (with stainless steel cladding); stainless steel piping, piping components, and piping elements exposed to treated borated water (primary oxygen levels controlled)	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, "Water Chemistry"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to treated borated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-30	Concrete; cementitious material piping, piping components, and piping elements exposed to raw water	Changes to material properties due to aggressive chemical attack	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	The nonsafety-related concrete circulating water intake piping (included in scope for a rare tornado event) is designed and constructed to AWWA C-300, -301, -302 requirements resulting in dense, well-cured high strength concrete with low permeability. The pipe is exposed to raw water (river water) that is not aggressive. Consequently, changes in material properties is not a significant aging effect for the piping. Nevertheless, the One-Time Inspection Program will confirm that unacceptable degradation is not occurring.
3.3.1-30.5	Fiberglass, HDPE piping, piping components, and piping elements exposed to raw water (internal)	Cracking, blistering, change in color due to water absorption	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	There are no fiberglass or HDPE components exposed to raw water in the auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-31	Concrete; cementitious material piping, piping components, and piping elements exposed to raw water	Cracking due to settling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	The nonsafety-related concrete circulating water intake piping is included in scope for a rare tornado event. Bedding under this piping conforms to Class A or Class C as specified by the American Concrete Pipe Association which provides a densely compacted backfill limiting the potential for settlement leading to cracking of the concrete piping. Consequently, cracking of the piping due to settling is not a significant aging effect for the piping. Nevertheless, the One-Time Inspection Program will confirm that unacceptable degradation is not occurring.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-32	Reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to raw water	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	The nonsafety-related concrete circulating water intake piping (included in scope for a rare tornado event) is designed and constructed to AWWA C-300, -301, -302 requirements resulting in dense, well-cured high strength concrete with low permeability. The pipe is exposed to raw water (river water) that is not aggressive. Consequently, cracking and changes in material properties are not significant aging effects for the piping. Nevertheless, the One-Time Inspection Program will confirm that unacceptable degradation is not occurring.
3.3.1-32.5	Elastomer seals and components exposed to raw water	Hardening and loss of strength due to elastomer degradation; loss of material due to erosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	There are no elastomer components exposed to raw water in the auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-33	Concrete; cementitious material piping, piping components, and piping elements exposed to raw water	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	The nonsafety-related concrete circulating water intake piping (included in scope for a rare tornado event) is designed and constructed to AWWA C-300, -301, -302 requirements resulting in dense, well-cured high strength concrete with low permeability. The pipe is exposed to raw water (river water) that is not aggressive. Consequently, loss of material is not a significant aging effect for the piping. Nevertheless, the One-Time Inspection Program will confirm that unacceptable degradation is not occurring.
3.3.1-34	Nickel alloy, copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no nickel alloy or copper alloy auxiliary system components exposed to raw water in the scope of license renewal, other than the copper alloy heat exchanger components compared to Item 3.3.1-38 below.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-35	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	There are no copper alloy auxiliary system components exposed to raw water in the scope of license renewal, other than the heat exchanger components compared to Item 3.3.1-38 below.
3.3.1-36	Copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	There are no copper alloy auxiliary system components exposed to raw water in the scope of license renewal, other than the heat exchanger components compared to Item 3.3.1-38 below.
3.3.1-37	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. Loss of material for steel components exposed to raw water is managed by the Service Water Integrity Program.
3.3.1-38	Copper alloy, steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. Loss of material for copper alloy and steel heat exchanger components exposed to raw water is managed by the Service Water Integrity Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-39	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Stainless steel piping components exposed to raw water are addressed in Item 3.3.1-40.
3.3.1-40	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to raw water is managed by the Service Water Integrity Program.
3.3.1-41	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Stainless steel piping components exposed to raw water are addressed in Item 3.3.1-40.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-42	Copper alloy, titanium, stainless steel heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	Consistent with NUREG-1801. Reduction of heat transfer for stainless steel heat exchanger tubes exposed to raw water is managed by the Service Water Integrity Program. For the fire pump diesel cooler, reduction of heat transfer for the copper alloy heat exchanger tubes exposed to raw water is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. There are no titanium heat exchanger tubes exposed to raw water with a heat transfer intended function in the auxiliary systems in the scope of license renewal.
3.3.1-43	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Cracking of stainless steel components exposed to closed-cycle cooling water >60°C (>140°F) is managed by the Water Chemistry Control – Closed Treated Water Systems Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-44	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Cracking of stainless steel heat exchanger components exposed to closed-cycle cooling water >60°C (>140°F) is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.3.1-45	Steel piping, piping components, and piping elements; tanks exposed to closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.3.1-46	Steel, copper alloy heat exchanger components, piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to general, pitting, and crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material for steel and copper alloy components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.3.1-47	BWR only				
3.3.1-48	Aluminum piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no aluminum components exposed to closed-cycle cooling water in the auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-49	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.3.1-50	Stainless steel, copper alloy, steel heat exchanger tubes exposed to closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Reduction of heat transfer for steel, stainless steel and copper alloy heat exchanger tubes exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
3.3.1-51	Boraflex spent fuel storage racks: neutron-absorbing sheets (PWR), spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to treated borated water, treated water	Reduction of neutron-absorbing capacity due to boraflex degradation	Chapter XI.M22, “Boraflex Monitoring”	No	Boraflex is not used in the WF3 spent fuel storage racks.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-52	Steel cranes: rails and structural girders exposed to air – indoor, uncontrolled (external)	Loss of material due to general corrosion	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No	Consistent with NUREG-1801. Loss of material for steel crane rails and structural girders exposed to indoor air is managed by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Inspection of OVHLL) Program. This item applies to aging management review results presented in Tables 3.5.2-X.
3.3.1-53	Steel cranes – rails exposed to air – indoor, uncontrolled (external)	Loss of material due to wear	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No	Visual inspections under the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program manage loss of material.
3.3.1-54	Copper alloy piping, piping components, and piping elements exposed to condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M24, "Compressed Air Monitoring"	No	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to condensation is managed by the Compressed Air Monitoring Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-55	Steel piping, piping components, and piping elements: compressed air system exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Chapter XI.M24, “Compressed Air Monitoring"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to condensation is managed by the Compressed Air Monitoring Program.
3.3.1-56	Stainless steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to condensation is managed by the Compressed Air Monitoring Program.
3.3.1-57	Elastomers fire barrier penetration seals exposed to air - indoor, uncontrolled, air – outdoor	Increased hardness; shrinkage; loss of strength due to weathering	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801. Increased hardness, shrinkage and loss of strength of elastomer fire barrier seals exposed to indoor air are managed by the Fire Protection Program. This item applies to aging management review results presented in Table 3.5.2-4.
3.3.1-58	Steel Halon/carbon dioxide fire suppression system piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801. Loss of material for steel fire protection components exposed to indoor air is managed by the Fire Protection Program. This item applies to aging management review results presented in Table 3.5.2-3.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-59	Steel fire rated doors exposed to air - indoor, uncontrolled, air – outdoor	Loss of material due to wear	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801. Loss of material of steel fire doors is managed by the Fire Protection Program. This item applies to aging management review results presented in Table 3.5.2-X.
3.3.1-60	Reinforced concrete structural fire barriers: walls, ceilings and floors exposed to air - indoor, uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Cracking of concrete fire barriers exposed to indoor air is managed by the Fire Protection and Structures Monitoring Programs. This item applies to aging management review results presented in Tables 3.5.2-X.
3.3.1-61	Reinforced concrete structural fire barriers: walls, ceilings and floors exposed to air – outdoor	Cracking, loss of material due to freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Cracking and loss of material of concrete fire barriers exposed to outdoor air are managed by the Fire Protection and Structures Monitoring Programs. This item applies to aging management review results presented in Tables 3.5.2-X.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-62	Reinforced concrete structural fire barriers: walls, ceilings and floors exposed to air - indoor, uncontrolled, air – outdoor	Loss of material due to corrosion of embedded steel	Chapter XI.M26, “Fire Protection,” and Chapter XI.S6, “Structures Monitoring”	No	Consistent with NUREG-1801. Loss of material of concrete fire barriers exposed to indoor or outdoor air is managed by the Fire Protection and Structures Monitoring Programs. This item applies to aging management review results presented in Tables 3.5.2-X.
3.3.1-63	Steel fire hydrants exposed to air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801. Loss of material for steel fire hydrants exposed to outdoor air is managed by the Fire Water System Program.
3.3.1-64	Steel, copper alloy piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801. Loss of material for steel and copper alloy fire protection system components exposed to raw water is managed by the Fire Water System Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-65	Aluminum piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	There are no aluminum auxiliary system components exposed to raw water in the scope of license renewal.
3.3.1-66	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801. Loss of material for stainless steel fire protection system components exposed to raw water is managed by the Fire Water System Program.
3.3.1-67	Steel tanks exposed to air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	The only steel tank exposed to outdoor air in the scope of license renewal is the fire water storage tank. Loss of material for the fire water storage tank is addressed in Item 3.3.1-136.
3.3.1-68	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-69	Copper alloy piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.
3.3.1-70	Steel piping, piping components, and piping elements; tanks exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Stainless steel, aluminum piping, piping components, and piping elements exposed to fuel oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material. There are no aluminum components exposed to fuel oil in the scope of license renewal.
3.3.1-72	Gray cast iron, copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements, heat exchanger components exposed to treated water, closed-cycle cooling water, soil, raw water, waste water	Loss of material due to selective leaching	Chapter XI.M33, "Selective Leaching"	No	Consistent with NUREG-1801. Loss of material due to selective leaching for gray cast iron and copper alloy (>15% Zn or >8% Al) components is managed by the Selective Leaching Program.
3.3.1-73	Concrete; cementitious material piping, piping components, and piping elements exposed to air – outdoor	Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no concrete piping components exposed to outdoor air in the auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-74	Concrete; cementitious material piping, piping components, and piping elements exposed to air – outdoor	Cracking due to settling	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no concrete piping components exposed to outdoor air in the auxiliary systems in the scope of license renewal.
3.3.1-75	Reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to air – outdoor	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no reinforced concrete or asbestos cement components exposed to outdoor air in the auxiliary systems in the scope of license renewal.
3.3.1-76	Elastomers elastomer: seals and components exposed to air – indoor, uncontrolled (internal/ external)	Hardening and loss of strength due to elastomer degradation	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801 for most components. Cracking and change in material properties of elastomer components exposed to indoor air are managed by the External Surfaces Monitoring Program. The Periodic Surveillance and Preventive Maintenance Program manages these aging effects for the portable flexible duct that can be used with the portable smoke exhaust fan in the control room HVAC system.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-77	Concrete; cementitious material piping, piping components, and piping elements exposed to air – outdoor	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components”	No	There are no concrete piping components exposed to outdoor air in the auxiliary systems in the scope of license renewal.
3.3.1-78	Steel piping and components (external surfaces), ducting and components (external surfaces), ducting; closure bolting exposed to air – indoor, uncontrolled (external), air – indoor, uncontrolled (external), air – outdoor (external), condensation (external)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-1801 for most components. Loss of material for most steel components exposed to indoor air, outdoor air or condensation is managed by the External Surfaces Monitoring Program. The Periodic Surveillance and Preventive Maintenance Program manages loss of material for the portable steel smoke exhaust fan.
3.3.1-79	Copper alloy piping, piping components, and piping elements exposed to condensation (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components”	No	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to condensation is managed by the External Surfaces Monitoring Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-80	Steel heat exchanger components, piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external), air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to indoor or outdoor air is managed by the External Surfaces Monitoring Program.
3.3.1-81	Copper alloy, aluminum piping, piping components, and piping elements exposed to air – outdoor (external), air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material for copper alloy and aluminum components exposed to outdoor air is managed by the External Surfaces Monitoring Program.
3.3.1-82	Elastomers elastomer: seals and components exposed to air – indoor, uncontrolled (external)	Loss of material due to wear	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Wear of external surfaces of elastomer components exposed to indoor air is managed by the External Surfaces Monitoring Program.
3.3.1-83	Stainless steel diesel engine exhaust piping, piping components, and piping elements exposed to diesel exhaust	Cracking due to stress corrosion cracking	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Cracking of stainless steel diesel engine exhaust components is managed by the Periodic Surveillance and Preventive Maintenance Program.
3.3.1-84	[There is no 3.3.1-84 in NUREG-1800]				

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-85	Elastomers elastomer seals and components exposed to closed-cycle cooling water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no elastomer components exposed to closed-cycle cooling water in the auxiliary systems in the scope of license renewal.
3.3.1-86	Elastomers elastomers, linings, elastomer: seals and components exposed to treated borated water, treated water, raw water	Hardening and loss of strength due to elastomer degradation	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no elastomer components exposed to treated borated water, treated water or raw water in the auxiliary systems in the scope of license renewal.
3.3.1-87	[There is no 3.3.1-87 in NUREG-1800.]				
3.3.1-88	Steel; stainless steel piping, piping components, and piping elements, piping, piping components, and piping elements, diesel engine exhaust exposed to raw water (potable), diesel exhaust	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for steel and stainless steel components exposed to diesel exhaust or raw water (potable) is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-89	Steel, copper alloy piping, piping components, and piping elements exposed to moist air or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	For fire water system components: Chapter XI.M27, "Fire Water System," or for other components: Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for steel and copper alloy components exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. Steel and copper alloy fire water system piping components exposed to condensation are addressed in Item 3.3.1-131.
3.3.1-90	Steel ducting and components (internal surfaces) exposed to condensation (internal)	Loss of material due to general, pitting, crevice, and (for drip pans and drain lines) microbiologically influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no steel duct components internally exposed to condensation in the auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-91	Steel piping, piping components, and piping elements; tanks exposed to waste water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 for most steel components exposed to waste water. For these components, loss of material is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections or other NDE techniques to manage loss of material for steel components abandoned in place.
3.3.1-92	Aluminum piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Aluminum components within the scope of license renewal that are exposed to internal condensation, are associated with compressed air systems. Loss of material for these aluminum components is managed by the Compressed Air Monitoring Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-93	Copper alloy piping, piping components, and piping elements exposed to raw water (potable)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to raw water (potable) is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
3.3.1-94	Stainless steel ducting and components exposed to condensation	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for stainless steel components internally exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-95	Copper alloy, stainless steel, nickel alloy, steel piping, piping components, and piping elements, heat exchanger components, piping, piping components, and piping elements; tanks exposed to waste water, condensation (internal)	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 for most copper alloy and stainless steel components exposed to waste water or condensation. For these components, loss of material is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections or other NDE techniques to manage loss of material for stainless steel components abandoned in place. There are no nickel alloy components exposed to waste water in the auxiliary systems in the scope of license renewal. Steel components internally exposed to condensation are addressed in Items 3.3.1-55, 3.3.1-89, 3.3.1-131 and 3.3.1-136.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-96	Elastomers elastomer: seals and components exposed to air – indoor, uncontrolled (internal)	Loss of material due to wear	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801 for most components. Wear of internal surfaces of elastomer components exposed to indoor air is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. Wear of the portable duct used with the portable smoke exhaust fan is managed by the Periodic Surveillance and Preventive Maintenance Program.
3.3.1-97	Steel piping, piping components, and piping elements, reactor coolant pump oil collection system: tanks, reactor coolant pump oil collection system: piping, tubing, valve bodies exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 for most components. Loss of material for most steel components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material. The Periodic Surveillance and Preventive Maintenance Programs uses periodic visual inspections to manage loss of material for steel reactor coolant pump oil collection system components exposed to lube oil.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-98	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel heat exchanger components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.
3.3.1-99	Copper alloy, aluminum piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for copper alloy and aluminum components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-100	Stainless steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801 for most components. Loss of material for stainless steel components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material. For stainless steel components in the RCP oil collection subsystem of the fire protection equipment, the Periodic Surveillance and Preventive Maintenance and External Surfaces Monitoring Programs manage loss of material.
3.3.1-101	Aluminum heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	There are no aluminum heat exchanger tubes exposed to lube oil with an intended function of heat transfer in systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-102	Boral®; boron steel, and other materials (excluding Boraflex) spent fuel storage racks: neutron-absorbing sheets (PWR), spent fuel storage racks: neutron-absorbing sheets (BWR) exposed to treated borated water, treated water	Reduction of neutron-absorbing capacity; change in dimensions and loss of material due to effects of SFP environment	Chapter XI.M40, "Monitoring of Neutron-Absorbing Materials other than Boraflex"	No	Consistent with NUREG-1801. Reduction in neutron absorption capacity, change in material properties and loss of material for Boral is managed by the Neutron-Absorbing Material Monitoring Program. The Water Chemistry Control – Primary and Secondary Program supplements management of loss of material.
3.3.1-103	Reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to soil or concrete	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	The nonsafety-related concrete circulating water intake piping is addressed in Item 3.3.1-105.
3.3.1-104	HDPE, fiberglass piping, piping components, and piping elements exposed to soil or concrete	Cracking, blistering, change in color due to water absorption	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no fiberglass or HDPE components exposed to soil or concrete in the systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-105	Concrete cylinder piping, asbestos cement pipe piping, piping components, and piping elements exposed to soil or concrete	Cracking, spalling, corrosion of rebar due to exposure of rebar	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-1801. Cracking and loss of material for concrete piping exposed to soil is managed by the Buried and Underground Piping and Tanks Inspection Program.
3.3.1-106	Steel (with coating or wrapping) piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to soil is managed by the Buried and Underground Piping and Tanks Inspection Program.
3.3.1-107	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no stainless steel or nickel alloy components exposed to soil or concrete in the auxiliary systems in the scope of license renewal.
3.3.1-108	Titanium, super austenitic, aluminum, copper alloy, stainless steel, nickel alloy piping, piping components, and piping elements, bolting exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	None of the component type, material and environment combinations represented by this item apply to components in systems included in the scope of license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-109	Steel bolting exposed to soil or concrete	Loss of material due to general, pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-1801. Loss of material for steel bolting exposed to soil is managed by the Buried and Underground Piping and Tanks Inspection Program. There is no steel bolting embedded in concrete in systems in the scope of license renewal.
3.3.1-109.5	Underground aluminum, copper alloy, stainless steel, nickel alloy, steel piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no underground components in auxiliary systems in the scope of license renewal.
3.3.1-110	BWR only				
3.3.1-111	Steel structural steel exposed to air – indoor, uncontrolled (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.S6, "Structures Monitoring"	No	Aging management review results for structural steel components are presented in and compared to NUREG-1801 items in Section 3.5.

Table 3.3.1: Auxiliary Systems					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-112	Steel piping, piping components, and piping elements exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	Consistent with NUREG-1801. Embedded steel components are in concrete that meets the guidelines of ACI 318 for safety-related concrete structures. Operating experience indicates no aging-related degradation of this concrete.
3.3.1-113	Aluminum piping, piping components, and piping elements exposed to air – dry (internal/external), air – indoor, uncontrolled (internal/external), air – indoor, controlled (external), gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air and gas) environments.
3.3.1-114	Copper alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (internal/ external), air – dry, gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air and gas) environments.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-115	Copper alloy (≤15% Zn and ≤8% Al) piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA - No AEM or AMP	There are no copper alloy (≤15% Zn or ≤8% Al) components exposed to air with borated water leakage in the auxiliary systems in the scope of license renewal.
3.3.1-116	Galvanized steel piping, piping components, and piping elements exposed to air - indoor, uncontrolled	None	None	NA – No AEM or AMP	Galvanized (zinc) coating applied to some steel components is not credited for corrosion protection for license renewal.
3.3.1-117	Glass piping elements exposed to air – indoor, uncontrolled (external), lubricating oil, closed-cycle cooling water, air – outdoor, fuel oil, raw water, treated water, treated borated water, air with borated water leakage, condensation (internal/external) gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air, air with borated water leakage, closed-cycle cooling water, condensation, lube oil, raw water, treated borated water and treated water) environments.
3.3.1-118	Nickel alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external)	None	None	NA – No AEM or AMP	There are no nickel alloy components in the auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-119	Nickel alloy, PVC, glass piping, piping components, and piping elements exposed to air with borated water leakage, air – indoor, uncontrolled, condensation (internal), waste water	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for glass components exposed to waste water. Other material environment combinations represented by this item are not applicable to auxiliary system components in the scope of license renewal.
3.3.1-120	Stainless steel piping, piping components, and piping elements exposed to air – indoor, uncontrolled (internal/ external), air – indoor, uncontrolled (external), air with borated water leakage, concrete, air – dry, gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air, air with borated water leakage, and gas) environments.
3.3.1-121	Steel piping, piping components, and piping elements exposed to air – indoor, controlled (external), air – dry, gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (gas) environment.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-122	Titanium heat exchanger components, piping, piping components, and piping elements exposed to air – indoor, uncontrolled or air – outdoor	None	None	NA – No AEM or AMP	There are no titanium components included in systems in the scope of license renewal.
3.3.1-123	Titanium (ASTM Grades 1,2, 7, 11, or 12 that contains > 5% aluminum or more than 0.20% oxygen or any amount of tin) heat exchanger components other than tubes, piping, piping components, and piping elements exposed to raw water	None	None	NA – No AEM or AMP	There are no titanium components included in systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-124	Stainless steel, steel (with stainless steel or nickel-alloy cladding) spent fuel storage racks (BWR), spent fuel storage racks (PWR), piping, piping components, and piping elements; exposed to treated water >60°C (>140°F), treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Cracking for stainless steel components exposed to treated borated water (primary) >60°C (>140°F) is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program. The spent fuel pool is normally maintained at a temperature below 140°F, consequently, cracking is not a significant aging effect for the stainless steel spent fuel pool components.
3.3.1-125	Steel (with stainless steel cladding); stainless steel spent fuel storage racks (BWR), spent fuel storage racks (PWR), piping, piping components, and piping elements exposed to treated water, treated borated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to treated borated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-126	Any material, piping, piping components, and piping elements exposed to treated water, treated water (borated), raw water	Wall thinning due to erosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801. Loss of material due to erosion for steel components exposed to raw water is managed by the Flow-Accelerated Corrosion Program.
3.3.1-127	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific	For carbon steel piping of the fire protection – water system, loss of material due to recurring internal corrosion is managed by the Fire Water System Program. See Section 3.3.2.2.8.
3.3.1-128	Steel, stainless steel, or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, or crevice corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M29, "Aboveground Metallic Tanks"	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank constructed on soil or concrete in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-129	Steel tanks exposed to soil or concrete; air-indoor uncontrolled, raw water, treated water, waste water, condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Loss of material for the steel fire water storage tank constructed on soil and concrete is managed by the Fire Water System Program.
3.3.1-130	Metallic sprinklers exposed to air-indoor controlled, air-indoor uncontrolled, air-outdoor, moist air, condensation, raw water, treated water	Loss of material due to general (where applicable), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, “Fire Water System”	No	Consistent with NUREG-1801. Loss of material for sprinklers exposed to condensation or raw water is managed by the Fire Water System Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-131	Steel, stainless steel, copper alloy, or aluminum fire water system piping, piping components and piping elements exposed to air-indoor uncontrolled (internal), air-outdoor (internal), or condensation (internal)	Loss of material due to general (steel, and copper alloy only), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; flow blockage due to fouling	Chapter XI.M27, “Fire Water System”	No	Consistent with NUREG-1801 for most components. Loss of material for steel, copper alloy and stainless steel fire water system components internally exposed to condensation is managed by the Fire Water System Program. For the fire water system piping and flame arrestor exposed internally to outdoor air, the Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material.
3.3.1-132	Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy only), pitting, and crevice corrosion; cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy (>15% Zn) only)	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, “Aboveground Metallic Tanks” (for tanks only)	No	Consistent with NUREG-1801 for insulated carbon steel, copper alloy and stainless steel components exposed to condensation or outdoor air. Loss of material and cracking (stainless steel only) is managed by the External Surfaces Monitoring Program. There are no insulated aluminum or copper alloy > 15% Zn or > 8% Al piping components in auxiliary systems in the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-133	Underground HDPE piping, piping components, and piping elements in an air-indoor uncontrolled or condensation (external) environment	Cracking, blistering, change in color due to water absorption	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no underground components in auxiliary systems in the scope of license renewal.
3.3.1-134	Steel, stainless steel, or copper alloy piping, piping components, and piping elements, and heat exchanger components exposed to a raw water environment (for nonsafety-related components not covered by NRC GL 89-13)	Loss of material due to general (steel and copper alloy only), pitting, crevice, and microbiologically influenced corrosion, fouling that leads to corrosion	Chapter XI.MI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for nonsafety-related steel, stainless steel and copper alloy components exposed to raw water (not covered by NRC GL 89-13) is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-135	Steel or stainless steel pump casings submerged in a waste water (internal and external) environment	Loss of material due to general (steel only), pitting, crevice, and microbiologically influenced corrosion	Chapter XI.MI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801 for some components. Loss of material for external steel surfaces exposed to waste water is managed by the External Surfaces Monitoring Program. Loss of material for internal steel surfaces exposed to waste water is managed by the Periodic Surveillance and Preventive Maintenance Program using periodic visual inspections.
3.3.1-136	Steel, stainless steel or aluminum fire water storage tanks exposed to air-indoor uncontrolled, air-outdoor, condensation, moist air, raw water, treated water	Loss of material due to general (steel only), pitting, crevice, and microbiologically-influenced corrosion, fouling that leads to corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801. Loss of material for steel and stainless steel components exposed to outdoor air, condensation or raw water is managed by the Fire Water System Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-137	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to treated water, treated borated water	Loss of material due to general (steel only) pitting and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.
3.3.1-138	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, waste water, lubricating oil, or fuel oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-1801. Loss of coating or lining integrity for metallic components with internal coating or linings is managed by the Coating Integrity Program.
3.3.1-139	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-1801. Loss of material for metallic components with internal coating or linings is managed by the Coating Integrity Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-140	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	Consistent with NUREG-1801. Loss of material due to selective leaching for gray cast iron components with internal coating or linings is managed by the Coating Integrity Program.

Notes for Tables 3.3.2-1 through 3.3.2-15-36

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

301. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

302. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

303. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program.

304. This tank is located indoors and is seated on (not embedded in) concrete.

305. These components have openings that expose the internal surfaces to outdoor air. Because the internal and external surfaces are exposed to the same environments, aging effects of the internal surfaces can be inferred from external surface conditions.

306. The (int) and (ext) environment designations refer to the nominal internal and external surfaces of the component and may not be consistent with the internal and external environment designations used in NUREG-1801. Consequently, an air or condensation (ext) environment for a component contained within a duct or other enclosure can correspond directly to a NUREG-1801 air or condensation (internal) environment.
307. This treated water is equivalent to the NUREG-1801 closed-cycle cooling water environment.
308. The aging mechanism for loss of material in this line is selective leaching.

Table 3.3.2-1
Chemical and Volume Control System
Summary of Aging Management Evaluation

Table 3.3.2-1: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Accumulator	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	VII.E1.AP-122	3.3.1-11	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A

Table 3.3.2-1: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Demineralizer	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301
Gear box housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Gear box housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Gear box housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-127	3.3.1-97	A, 302
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	VII.E1.AP-119 VII.E1.AP-118	3.3.1-8 3.3.1-20	A A, 301

Table 3.3.2-1: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Heat exchanger (shell) letdown	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Heat exchanger (shell) letdown	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (shell) letdown	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.E1.AP-189	3.3.1-46	A
Heat exchanger (shell) regenerative	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (shell) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Closed Treated Water Systems	VII.E1.AP-119 VII.E1.AP-118	3.3.1-8 3.3.1-20	A A, 301
Heat exchanger (shell) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A

Table 3.3.2-1: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (shell) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Heat exchanger (tube sheet) letdown	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-69	3.3.1-3	E
Heat exchanger (tube sheet) letdown	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tube sheet) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118	3.3.1-20	A, 301
Heat exchanger (tube sheet) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118	3.3.1-20	A, 301

Table 3.3.2-1: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tube sheet) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A
Heat exchanger (tube sheet) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water > 140°F (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	VII.E1.A-101	3.3.1-17	A, 301
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Heat exchanger (tubes) letdown	Heat transfer	Stainless steel	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C
Heat exchanger (tubes) letdown	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-69	3.3.1-3	E
Heat exchanger (tubes) letdown	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C

Table 3.3.2-1: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes) regenerative	Heat transfer	Stainless steel	Treated borated water > 140°F (ext)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	VII.E1.A-101	3.3.1-17	A, 301
Heat exchanger (tubes) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118	3.3.1-20	A, 301
Heat exchanger (tubes) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A
Heat exchanger (tubes) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Heat exchanger (tubes) regenerative	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118	3.3.1-20	A, 301
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A

Table 3.3.2-1: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	A, 302
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82 VII.E1.A-103	3.3.1-28 3.3.1-124	A A, 301
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	A
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Pump casing	Pressure boundary	CASS	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Pump casing	Pressure boundary	CASS	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A

Table 3.3.2-1: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Cracking	Inservice Inspection	VII.E1.AP-115	3.3.1-7	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Strainer	Filtration	Stainless steel	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88	3.3.1-29	A
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82 VII.E1.A-103	3.3.1-28 3.3.1-124	A A, 301

Table 3.3.2-1: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	A, 302
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301

Table 3.3.2-1: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82 VII.E1.A-103	3.3.1-28 3.3.1-124	A A, 301
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	A
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-88 VII.E1.AP-79	3.3.1-29 3.3.1-125	A A, 301
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C

Table 3.3.2-2
Chilled Water System
Summary of Aging Management Evaluation

Table 3.3.2-2: Chilled Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blower housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	D
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	D
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Flow element	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.3.2-2: Chilled Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-138	3.3.1-100	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C

Table 3.3.2-2: Chilled Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-138	3.3.1-100	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	A
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Lube oil (ext)	Reduction of heat transfer	Oil Analysis	V.D1.EP-79	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.C2.AP-138	3.3.1-100	C, 302

Table 3.3.2-2: Chilled Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Insulated piping components	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.C2.A-405	3.3.1-132	A
Insulated piping components	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.C2.A-405	3.3.1-132	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary Flow control	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-2: Chilled Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Piping	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Piping	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Piping	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-127	3.3.1-97	A, 302
Pump casing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C

Table 3.3.2-2: Chilled Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	Selective Leaching	--	--	H
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Tank	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of coating integrity	Coating Integrity	VII.C2.A-416	3.3.1-138	B, 307
Tank	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of material	Coating Integrity	VII.C2.A-414	3.3.1-139	B, 307
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.3.2-2: Chilled Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Tubing	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-133	3.3.1-99	A, 302
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-138	3.3.1-100	A, 302

Table 3.3.2-2: Chilled Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	Selective Leaching	--	--	H

Table 3.3.2-2: Chilled Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (int)	Loss of material	Oil Analysis	VII.C2.AP-133	3.3.1-99	A, 302
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-3
Component Cooling and Auxiliary Component Cooling Water System
Summary of Aging Management Evaluation

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blower housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 305
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	VII.I.A-04	3.3.1-10	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Cracking	Bolting Integrity	VII.I.A-04	3.3.1-10	B
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Coil	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
Coil	Pressure boundary	Copper alloy	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	A
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Fan housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Fan housing	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 305
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Cracking	External Surfaces Monitoring	--	--	G
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Reduction of heat transfer	Periodic Surveillance and Preventive Maintenance	--	--	G
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tubes)	Heat transfer	Carbon steel	Condensation (ext)	Reduction of heat transfer	Periodic Surveillance and Preventive Maintenance	--	--	G
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heat exchanger (tubes)	Heat transfer	Carbon steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.F1.AP-204	3.3.1-50	C
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (ext)	Reduction of heat transfer	Service Water Integrity	VII.C1.AP-187	3.3.1-42	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.C1.A-405	3.3.1-132	A
Insulated piping components	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.C1.A-405	3.3.1-132	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Nozzle	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.C1.AP-209	3.3.1-4	A
Nozzle	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.C1.AP-221	3.3.1-6	A
Nozzle	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary Flow control	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.C1.AP-198	3.3.1-106	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Piping	Pressure boundary	Carbon steel with internal coating	Raw water (int)	Loss of coating integrity	Coating Integrity	VII.C1.A-416	3.3.1-138	B
Piping	Pressure boundary	Carbon steel with internal coating	Raw water (int)	Loss of material	Coating Integrity	VII.C1.A-414	3.3.1-139	B
Piping	Pressure boundary	Concrete	Raw water (int)	Change in material properties	One-Time Inspection	VII.C1.AP-250 VII.C1.AP-155	3.3.1-30 3.3.1-32	E
Piping	Pressure boundary	Concrete	Raw water (int)	Cracking	One-Time Inspection	VII.C1.AP-248 VII.C1.AP-155	3.3.1-31 3.3.1-32	E
Piping	Pressure boundary	Concrete	Raw water (int)	Loss of material	One-Time Inspection	VII.C1.AP-249	3.3.1-33	E
Piping	Pressure boundary	Concrete	Soil (ext)	Cracking	Buried and Underground Piping and Tanks Inspection	VII.C1.AP-178	3.3.1-105	A
Piping	Pressure boundary	Concrete	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.C1.AP-178	3.3.1-105	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.A.E-29	3.2.1-44	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of coating integrity	Coating Integrity	VII.C2.A-414	3.3.1-138	B, 307
Tank	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of material	Coating Integrity	VII.C2.A-414	3.3.1-139	B, 307
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Thermowell	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material – erosion	Flow-Accelerated Corrosion	VII.C1.A-409	3.3.1-126	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-3: Component Cooling and Auxiliary Component Cooling Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-4
Compressed Air System
Summary of Aging Management Evaluation

Table 3.3.2-4: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Accumulator	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Accumulator	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Accumulator	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Filter housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
Filter housing	Pressure boundary	Plastic	Air – indoor (ext)	None	None	--	--	F

Table 3.3.2-4: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Plastic	Condensation (int)	None	None	--	--	F
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Flex hose	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	C
Flex hose	Pressure boundary	Elastomer	Condensation (int)	None	None	--	--	G
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flex hose	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.D.AP-209	3.3.1-4	A

Table 3.3.2-4: Compressed Air System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.AP-221	3.3.1-6	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Regulator body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Regulator body	Pressure boundary	Aluminum	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.F2.AP-142	3.3.1-92	E
Regulator body	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Regulator body	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	A
Regulator body	Pressure boundary	Plastic	Air – indoor (ext)	None	None	--	--	F
Regulator body	Pressure boundary	Plastic	Condensation (int)	None	None	--	--	F
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.D.AP-209	3.3.1-4	A

Table 3.3.2-4: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.AP-221	3.3.1-6	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Valve body	Pressure boundary	Aluminum	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.F2.AP-142	3.3.1-92	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
Valve body	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.D.AP-209	3.3.1-4	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.AP-221	3.3.1-6	A

Table 3.3.2-4: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A

Table 3.3.2-5
Containment Cooling HVAC System
Summary of Aging Management Evaluation

Table 3.3.2-5: Containment Cooling HVAC System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.AP-41	3.3.1-80	A
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A

Table 3.3.2-5: Containment Cooling HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F3.AP-113	3.3.1-82	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (int)	Loss of material – wear	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F3.AP-103	3.3.1-96	A
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C, 306
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H

Table 3.3.2-5: Containment Cooling HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.AP-41	3.3.1-80	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C, 306
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.F3.AP-205	3.3.1-50	A
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F3.AP-203	3.3.1-46	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-5: Containment Cooling HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-6
Control Room HVAC System
Summary of Aging Management Evaluation

Table 3.3.2-6: Control Room HVAC System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Damper housing	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C

Table 3.3.2-6: Control Room HVAC System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Ducting	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	Periodic Surveillance and Preventive Maintenance	VII.F1.AP-102	3.3.1-76	E
Ducting	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.F1.AP-102	3.3.1-76	E
Ducting	Pressure boundary	Elastomer	Air – indoor (int)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance	VII.F1.AP-103	3.3.1-96	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.F1.A-10	3.3.1-78	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C

Table 3.3.2-6: Control Room HVAC System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.A.E-29	3.2.1-44	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (int)	Loss of material – wear	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.AP-103	3.3.1-96	A

Table 3.3.2-6: Control Room HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C, 306
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C, 306

Table 3.3.2-6: Control Room HVAC System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.F1.AP-205	3.3.1-50	A
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F1.AP-203	3.3.1-46	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	C
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-6: Control Room HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-7
Emergency Diesel Generator System
Summary of Aging Management Evaluation

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blower	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Blower	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Blower	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-7: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.H2.AP-128	3.3.1-83	E
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Expansion joint	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Filter housing	Pressure boundary	Aluminum	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.F2.AP-142	3.3.1-92	E
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Filter housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 305
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (fins)	Heat transfer	Aluminum	Air – indoor (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2.AP-41	3.3.1-80	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2.AP-41	3.3.1-80	A
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Fuel oil (int)	Loss of coating integrity	Coating Integrity	VII.H2.A-416	3.3.1-138	B
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Fuel oil (int)	Loss of material	Coating Integrity	–	–	G
Heat exchanger (shell	Pressure boundary	Carbon steel with internal coating	Lube oil (int)	Loss of coating integrity	Coating Integrity	VII.H1.A-416	3.3.1-138	B
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Lube oil (int)	Loss of material	Coating Integrity	VII.H1.A-414	3.3.1-139	B
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of coating integrity	Coating Integrity	VII.H1.A-416	3.3.1-138	B

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of material	Coating Integrity	VII.H1.A-414	3.3.1-139	B
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H2.AP-136	3.3.1-71	C, 303
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.E3.AP-192	3.3.1-44	C
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Air – indoor (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.E1.AP-203	3.3.1-46	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Fuel oil (ext)	Reduction of heat transfer	Diesel Fuel Monitoring	--	--	G
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H2.AP-136	3.3.1-71	C, 303
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance	--	--	G
Heat exchanger (tubes)	Heat transfer	Stainless steel	Lube oil (ext)	Reduction of heat transfer	Oil Analysis	V.D1.EP-79	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	C, 302
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance	--	--	H

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance	--	--	H
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heater housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heater housing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	C, 302

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heater housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Heater housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Level indicator	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Level indicator	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.H2.AP-43	3.3.1-72	A
Level indicator	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	A
Level indicator	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-166	3.3.1-117	A
Level indicator	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Piping	Pressure boundary	Carbon steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303

Table 3.3.2-7: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.H1.AP-198	3.3.1-106	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Silencer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-7: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Strainer	Filtration	Carbon steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Strainer	Filtration	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Concrete (ext)	None	None	--	--	G, 304
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Tank	Pressure boundary	Carbon steel with internal coating	Fuel oil (int)	Loss of coating integrity	Coating Integrity	VII.H2.A-416	3.3.1-138	B

Table 3.3.2-7: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel with internal coating	Fuel oil (int)	Loss of material	Coating Integrity	--	--	G
Tank	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of coating integrity	Coating Integrity	VII.H1.A-416	3.3.1-138	B
Tank	Pressure boundary	Carbon steel with internal coating	Treated water (int)	Loss of material	Coating Integrity	VII.H1.A-414	3.3.1-139	B
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	C

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-132	3.3.1-69	A, 303
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-133	3.3.1-99	A, 302
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Tubing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C

Table 3.3.2-7: Emergency Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-7: Emergency Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-132	3.3.1-69	A, 303
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Valve body	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C

Table 3.3.2-8
Fire Protection – Water System
Summary of Aging Management Evaluation

Table 3.3.2-8: Fire Protection – Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.I.AP-241	3.3.1-109	A
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of preload	Bolting Integrity	VII.I.AP-242	3.3.1-14	B
Expansion joint	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Expansion joint	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	C
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A

Table 3.3.2-8: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flame arrestor	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.A-404	3.3.1-131	E
Flex hose	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Flex hose	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-132	3.3.1-69	A, 303
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.G.AP-41	3.3.1-80	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-72	3.3.1-42	E
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	D
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C

Table 3.3.2-8: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.E1.AP-203	3.3.1-46	C
Hydrant	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	Fire Water System	VII.G.AP-149	3.3.1-63	B
Hydrant	Pressure boundary	Gray cast iron with internal coating	Raw water (int)	Loss of coating integrity	Coating Integrity	VII.G.A-416	3.3.1-138	B
Hydrant	Pressure boundary	Gray cast iron with internal coating	Raw water (int)	Loss of material	Coating Integrity	VII.G.A-414	3.3.1-139	B
Hydrant	Pressure boundary	Gray cast iron with internal coating	Raw water (int)	Loss of material	Coating Integrity	VII.G.A-415	3.3.1-140	B, 308
Hydrant	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
Hydrant	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G.A-02	3.3.1-72	A
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.G.A-405	3.3.1-132	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-8: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.A-404	3.3.1-131	E
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	C
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-234	3.3.1-68	A, 303
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	B
Piping	Pressure boundary	Carbon steel	Raw water (int)	Recurring internal corrosion	Fire Water System	VII.G.A-400	3.3.1-127	E
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A

Table 3.3.2-8: Fire Protection – Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	B
Piping	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-51	3.3.1-72	A
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
Piping	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G.A-02	3.3.1-72	A
Piping	Pressure boundary	Plastic (PVC)	Raw water (int)	None	None	--	--	G
Piping	Pressure boundary	Plastic (PVC)	Soil (ext)	None	None	--	--	G
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	B
Silencer	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A

Table 3.3.2-8: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	C
Sprinkler	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sprinkler	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Condensation (int)	Loss of material	Fire Water System	VII.G.A-403	3.3.1-130	B
Sprinkler	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Fire Water System	VII.G.A-403	3.3.1-130	B
Sprinkler	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-47	3.3.1-72	A
Strainer	Filtration	Stainless steel	Condensation (ext)	Loss of material	Fire Water System	VII.G.A-412	3.3.1-136	D
Strainer	Filtration	Stainless steel	Raw water (ext)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	B
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	B

Table 3.3.2-8: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Strainer housing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	B
Strainer housing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-47	3.3.1-72	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Fire Water System	VII.G.A-412	3.3.1-136	B
Tank	Pressure boundary	Carbon steel	Concrete (ext)	Loss of material	Fire Water System	VII.G.A-402	3.3.1-129	E
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Fire Water System	VII.G.A-412	3.3.1-136	B
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	C, 303
Tank	Pressure boundary	Carbon steel with internal coating	Raw water (int)	Loss of coating integrity	Fire Water System	--	--	H
Tank	Pressure boundary	Carbon steel with internal coating	Raw water (int)	Loss of material	Fire Water System	VII.G.A-412	3.3.1-136	B

Table 3.3.2-8: Fire Protection – Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Fire Water System	VII.G.A-402	3.3.1-129	E
Trap	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Trap	Pressure boundary	Gray cast iron	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B
Tubing	Pressure boundary	Copper alloy	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-132	3.3.1-69	A, 303
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	B
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	B
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B

Table 3.3.2-8: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-234	3.3.1-68	A, 303
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	B
Valve body	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-159	3.3.1-81	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-132	3.3.1-69	A, 303
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	B
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-47	3.3.1-72	A

Table 3.3.2-8: Fire Protection – Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	B
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-51	3.3.1-72	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Fire Water System	VII.G.A-404	3.3.1-131	B
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	B
Vortex breaker	Flow control	Carbon steel	Raw water (ext)	Loss of material	Fire Water System	VII.G.A-412	3.3.1-136	D

Table 3.3.2-9
Fire Protection RCP Oil Collection System
Summary of Aging Management Evaluation

Table 3.3.2-9: Fire Protection RCP Oil Collection System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Drip pan	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Drip pan	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-117	3.3.1-97	E
Drip pan	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Drip pan	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-138	3.3.1-100	E
Enclosure	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-9: Fire Protection RCP Oil Collection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Enclosure	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-117	3.3.1-97	E
Enclosure	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Enclosure	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-138	3.3.1-100	E
Flame arrestor	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flame arrestor	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flex hose	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-138	3.3.1-100	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-9: Fire Protection RCP Oil Collection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-117	3.3.1-97	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-138	3.3.1-100	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-117	3.3.1-97	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VII.J.AP-15	3.3.1-117	A
Strainer	Filtration	Stainless steel	Lube oil (ext)	Loss of material	External Surfaces Monitoring	VII.G.AP-138	3.3.1-100	E

Table 3.3.2-9: Fire Protection RCP Oil Collection System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer	Filtration	Stainless steel	Lube oil (int)	Loss of material	External Surfaces Monitoring	VII.G.AP-138	3.3.1-100	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-117	3.3.1-97	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-138	3.3.1-100	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-117	3.3.1-97	E

Table 3.3.2-10
Fuel Pool Cooling and Purification System
Summary of Aging Management Evaluation

Table 3.3.2-10: Fuel Pool Cooling and Purification System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.A3.A-79	3.3.1-9	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.A3.AP-189	3.3.1-46	A

Table 3.3.2-10: Fuel Pool Cooling and Purification System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	VII.A3.A-101	3.3.1-17	A, 301
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Neutron Absorber	Neutron absorption	Boral	Treated borated water (ext)	Change in material properties	Neutron-Absorbing Material Monitoring	VII.A2.AP-235	3.3.1-102	A

Table 3.3.2-10: Fuel Pool Cooling and Purification System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Neutron Absorber	Neutron absorption	Boral	Treated borated water (ext)	Loss of material	Neutron-Absorbing Material Monitoring Water Chemistry Control – Primary and Secondary	VII.A2.AP-235	3.3.1-102	A
Neutron Absorber	Neutron absorption	Boral	Treated borated water (ext)	Reduction in neutron absorption capacity	Neutron-Absorbing Material Monitoring	VII.A2.AP-235	3.3.1-102	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301

Table 3.3.2-10: Fuel Pool Cooling and Purification System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Rack	Support for criterion (a)(1) equipment	Stainless steel	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-11
Nitrogen System
Summary of Aging Management Evaluation

Table 3.3.2-11: Nitrogen System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Accumulator	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Accumulator	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex hose	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A

Table 3.3.2-11: Nitrogen System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	Pressure boundary Flow control	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Regulator body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Regulator body	Pressure boundary	Aluminum	Gas (int)	None	None	VII.J.AP-37	3.3.1-113	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-11: Nitrogen System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.D.AP-209	3.3.1-4	C
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.AP-221	3.3.1-6	C
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A

Table 3.3.2-12
Miscellaneous HVAC Systems
Summary of Aging Management Evaluation

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	VII.I.A-04	3.3.1-10	D
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E

Table 3.3.2-12: Miscellaneous HVAC Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Damper housing	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A
Filter housing	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F2.AP-99	3.3.1-94	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F2.AP-113	3.3.1-82	A

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flex connection	Pressure boundary	Elastomer	Air – indoor (int)	Loss of material – wear	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F2.AP-103	3.3.1-96	A
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flex hose	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C, 306
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A

Table 3.3.2-12: Miscellaneous HVAC Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Reduction of heat transfer	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C, 306
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-205	3.3.1-50	A
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F3.AP-203	3.3.1-46	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Heater housing	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Nozzle	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Nozzle	Pressure boundary Flow control	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Air – indoor (int)	None	None	VII.J.AP-48	3.3.1-117	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.F2.AP-209	3.3.1-4	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-221	3.3.1-6	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-12: Miscellaneous HVAC Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-13
Auxiliary Diesel Generator System
Summary of Aging Management Evaluation

Table 3.3.2-13: Auxiliary Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	--	--	H
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	A
Flame arrestor	Pressure boundary	Aluminum	Air – outdoor (int)	Cracking	External Surfaces Monitoring	--	--	H
Flame arrestor	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	A
Flame arrestor	Pressure boundary	Gray cast iron	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 305
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-13:Auxiliary Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.A-23	3.3.1-89	A
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Silencer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Silencer	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.A-23	3.3.1-89	A

Table 3.3.2-13: Auxiliary Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tubing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303

Table 3.3.2-14
Plant Drains
Summary of Aging Management Evaluation

Table 3.3.2-14:Plant Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Waste water (ext)	Loss of material	Bolting Integrity	--	--	G
Bolting	Pressure boundary	Carbon steel	Waste water (ext)	Loss of preload	Bolting Integrity	--	--	G
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.B1.SP-59	3.4.1-36	C

Table 3.3.2-14:Plant Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.C1.AP-198	3.3.1-106	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Pump casing	Pressure boundary	Carbon steel	Waste water (ext)	Loss of material	External Surfaces Monitoring	VII.E5.A-410	3.3.1-135	A
Pump casing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.A-410	3.3.1-135	E

Table 3.3.2-14:Plant Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Pump casing	Pressure boundary	Gray cast iron	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.A-410	3.3.1-135	E
Pump casing	Pressure boundary	Gray cast iron	Waste water (int)	Loss of material	Selective Leaching	VII.E5.A-407	3.3.1-72	A
Strainer	Filtration	Stainless steel	Waste water (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.C1.AP-209	3.3.1-4	C
Strainer housing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.C1.AP-221	3.3.1-6	C
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-14:Plant Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Waste water (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A
Valve body	Pressure boundary	Copper alloy	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-159	3.3.1-81	A

Table 3.3.2-14:Plant Drains								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Copper alloy	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-272	3.3.1-95	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-159	3.3.1-81	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-272	3.3.1-95	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.E5.A-407	3.3.1-72	A
Valve body	Pressure boundary Flow control	Gray cast iron	Waste water (ext)	Loss of material	External Surfaces Monitoring	VII.E5.A-410	3.3.1-135	C
Valve body	Pressure boundary Flow control	Gray cast iron	Waste water (ext)	Loss of material	Selective Leaching	VII.E5.A-407	3.3.1-72	A
Valve body	Pressure boundary Flow control	Gray cast iron	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A

Table 3.3.2-14:Plant Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary Flow control	Gray cast iron	Waste water (int)	Loss of material	Selective Leaching	VII.E5.A-407	3.3.1-72	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.C1.AP-209	3.3.1-4	C
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.C1.AP-221	3.3.1-6	C
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-15-1
Air Evacuation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-1:Air Evacuation System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-2
Airborne Radioactivity Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-2:Airborne Radioactivity Removal System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-3
Annulus Negative Pressure System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-3:Annulus Negative Pressure System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blower housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A
Blower housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-15-3:Annulus Negative Pressure System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	A

Table 3.3.2-15-4
Auxiliary Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-4:Auxiliary Steam System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 301
Flow element	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Flow element	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 301
Flow element	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Insulated piping components	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A

Table 3.3.2-15-4:Auxiliary Steam System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-48	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-15-4:Auxiliary Steam System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C
Trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Trap	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-4:Auxiliary Steam System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 301

Table 3.3.2-15-5
Boric Acid Makeup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-5: Boric Acid Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-96	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated borated water (int)	None	None	VII.J.AP-52	3.3.1-117	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301

Table 3.3.2-15-5: Boric Acid Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	C, 301
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301

Table 3.3.2-15-6
Boron Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-6:Boron Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Condenser (Shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Condenser (Shell)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Cooler housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Cooler housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Demineralizer	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301

Table 3.3.2-15-6:Boron Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Evaporator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Evaporator	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Insulated piping components	Pressure boundary	Stainless steel	Condensation (ext)	Cracking	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A
Insulated piping components	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-6:Boron Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-96	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated borated water (int)	None	None	VII.J.AP-52	3.3.1-117	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-6:Boron Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	C, 301
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Trap	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-6:Boron Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-7
Chemical and Volume Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-7: Chemical and Volume Control System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Demineralizer	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Flex hose	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301

Table 3.3.2-15-7: Chemical and Volume Control System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-96	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A

Table 3.3.2-15-7: Chemical and Volume Control System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	C, 301
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-18	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-125	A, 301

Table 3.3.2-15-7: Chemical and Volume Control System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-8
Chemical Feed System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-8:Chemical Feed System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Cylinder	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Cylinder	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-8:Chemical Feed System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-48	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-8:Chemical Feed System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-9
Chilled Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-9: Chilled Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	D
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Insulated piping components	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.C2.A-405	3.3.1-132	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-15-9: Chilled Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-15-9: Chilled Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Tank	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-15-9: Chilled Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A

Table 3.3.2-15-10
Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-10:Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	D
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Insulated piping components	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-408	3.3.1-134	C
Sight glass	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-408	3.3.1-134	C
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VIII.I.SP-68	3.4.1-55	C

Table 3.3.2-15-10:Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J.AP-50	3.3.1-117	A
Strainer housing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Strainer housing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-409	3.3.1-134	C
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-408	3.3.1-134	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-408	3.3.1-134	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-15-10:Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-408	3.3.1-134	C
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	C

**Table 3.3.2-15-11
Component Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-15-11: Component Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	D
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Filter housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Flow element	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.C2.A-405	3.3.1-132	A
Insulated piping components	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.C2.A-405	3.3.1-132	A

Table 3.3.2-15-11: Component Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	C
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Plastic	Condensation (ext)	None	None	--	--	F
Piping	Pressure boundary	Plastic	Treated water (int)	None	None	--	--	F
Sight glass	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A

Table 3.3.2-15-11: Component Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-15-11: Component Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-15-12
Compressed Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-12:Compressed Air System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Piping	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	A

Table 3.3.2-15-12:Compressed Air System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-272	3.3.1-95	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.E5.A-407	3.3.1-72	C

Table 3.3.2-15-12:Compressed Air System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-13
Containment Atmosphere Purge System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-13:Containment Atmosphere Purge System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.AP-41	3.3.1-80	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-15-13:Containment Atmosphere Purge System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

**Table 3.3.2-15-14
Containment Atmosphere Release System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-15-14:Containment Atmosphere Release System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C

Table 3.3.2-15-15
Containment Building
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-15:Containment Building, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C

Table 3.3.2-15-16
Decontamination Facility
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-16:Decontamination Facility, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-16:Decontamination Facility, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-17
Emergency Diesel Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-17:Emergency Diesel Generator System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-17:Emergency Diesel Generator System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

**Table 3.3.2-15-18
Fuel Handling Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-15-18:Fuel Handling Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blower housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-18:Fuel Handling Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

**Table 3.3.2-15-19
Fuel Pool Cooling and Purification System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-15-19:Fuel Pool Cooling and Purification System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301

Table 3.3.2-15-19:Fuel Pool Cooling and Purification System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-19:Fuel Pool Cooling and Purification System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301

Table 3.3.2-15-20
Gaseous Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-20:Gaseous Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Cooler housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Cooler housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A

Table 3.3.2-15-20:Gaseous Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Separator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Separator	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-48	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-20:Gaseous Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Trap	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Trap	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-21
Hot Machine Shop and Decon Facility Vent System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-21:Hot Machine Shop & Decon Facility Vent System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-22
Leak Rate Testing System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-22:Leak Rate Testing System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Copper alloy	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-15-22:Leak Rate Testing System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Copper alloy	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-159	3.3.1-81	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-15-23
Liquid Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-23:Liquid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Condenser (Shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Condenser (Shell)	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-275	3.3.1-95	E
Cooler housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Cooler housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-275	3.3.1-95	E
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Demineralizer	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-15-23:Liquid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Evaporator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Evaporator	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-275	3.3.1-95	E
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-23:Liquid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-23:Liquid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-24
Nitrogen System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-24:Nitrogen System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-15-24:Nitrogen System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Trap	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-15-25
Post Accident Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-25:Post Accident Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Chiller housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	C
Chiller housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-25:Post Accident Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-25:Post Accident Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-26
Potable Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-26:Potable Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C
Pump casing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Pump casing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-271	3.3.1-93	C
Pump casing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C

Table 3.3.2-15-26:Potable Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-271	3.3.1-93	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C

**Table 3.3.2-15-27
Primary Makeup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-15-27:Primary Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Insulated piping components	Pressure boundary	Stainless steel	Condensation (ext)	Cracking	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A
Insulated piping components	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-405	3.3.1-132	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-15-27:Primary Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-28
Primary Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-28:Primary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-102	3.3.1-9	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Flex hose	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex hose	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-103	3.3.1-124	C
Flex hose	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-15-28:Primary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-103	3.3.1-124	C
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-28:Primary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Trap	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Trap	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-103	3.3.1-124	C
Trap	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Trap	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-103	3.3.1-124	C

Table 3.3.2-15-28:Primary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Vessel	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Vessel	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.A-103	3.3.1-124	C
Vessel	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Vessel	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.AP-79	3.3.1-125	C, 301

Table 3.3.2-15-29
Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-29:Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Filter housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Filter housing	Pressure boundary	Aluminum	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-29:Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-29:Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Trap	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-30
Reactor Auxiliary Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-30:Reactor Auxiliary Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-15-30:Reactor Auxiliary Building HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-15-31
Reactor Cavity Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-31:Reactor Cavity Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blower housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Ducting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Ducting	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E

Table 3.3.2-15-32
Resin Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-32:Resin Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-15-32:Resin Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-48	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-32:Resin Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-15-33
Secondary Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-33:Secondary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Cooler housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Cooler housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-15-33:Secondary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Piping	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 301
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301

Table 3.3.2-15-33:Secondary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Pump casing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Pump casing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C

Table 3.3.2-15-33:Secondary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Tank	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 301
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 301

Table 3.3.2-15-33:Secondary Sampling System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-15-34
Solid Waste Management System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-34: Solid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Accumulator	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-34: Solid Waste Management System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-15-35
Sump Pump System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-35:Sump Pump System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-15-35:Sump Pump System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-15-36
Turbine Building Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-15-36:Turbine Building Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-15-36:Turbine Building Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

3.4 STEAM AND POWER CONVERSION SYSTEMS

3.4.1 Introduction

This section provides the results of the aging management reviews for components in the steam and power conversion systems that are subject to aging management review. The following systems are addressed in this section (the system descriptions are available in the referenced section).

- Condensate Makeup and Storage (Section 2.3.4.1)
- Emergency Feedwater (Section 2.3.4.2)
- Main Feedwater (Section 2.3.4.3)
- Main Steam (Section 2.3.4.4)
- Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.4.5)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the steam and power conversion system component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.4.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for the condensate storage system.

- Table 3.4.2-1 Condensate Makeup and Storage System—Summary of Aging Management Evaluation
- Table 3.4.2-2 Emergency Feedwater System—Summary of Aging Management Evaluation
- Table 3.4.2-3 Main Feedwater System—Summary of Aging Management Evaluation
- Table 3.4.2-4 Main Steam System—Summary of Aging Management Evaluation

Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.4.2-5-1 Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-5-2 Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.4.2-5-3 Condensate Makeup and Storage System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-5-4 Emergency Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-5-5 Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-5-6 Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.4.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for the steam and power conversion systems. Programs are described in Appendix B. Further details are provided in the system tables.

3.4.2.1.1 <u>Condensate Makeup and Storage</u>

Materials

Condensate makeup and storage system components are constructed of the following materials.

- Carbon steel
- Stainless steel

Environments

Condensate makeup and storage system components are exposed to the following environments.

- Air – indoor
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the condensate makeup and storage system require management.

- Loss of material

- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the condensate makeup and storage system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.4.2.1.2 Emergency Feedwater

Materials

Emergency feedwater system components are constructed of the following materials.

- Carbon steel
- Gray cast iron
- High strength steel
- Stainless steel

Environments

Emergency feedwater system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Lube oil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the emergency feedwater system require management.

- Cracking
- Loss of material
- Loss of preload
- Reduction of heat transfer

Aging Management Programs

The following aging management programs manage the aging effects for the emergency feedwater system components.

- Bolting Integrity
- External Surfaces Monitoring
- Oil Analysis
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.4.2.1.3 Main Feedwater

Materials

Main feedwater system components are constructed of the following materials.

- Carbon steel
- High strength steel
- Stainless steel

Environments

Main feedwater system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Steam
- Treated water
- Treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the main feedwater system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – FAC
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the main feedwater system components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.4.2.1.4 Main Steam

Materials

Main steam system components are constructed of the following materials.

- Carbon steel
- CASS
- Glass
- Gray cast iron
- High strength steel
- Stainless steel

Environments

Main steam system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Lube oil
- Steam
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the main steam system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – erosion

- Loss of material – FAC
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the main steam system components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Selective Leaching
- Water Chemistry Control – Primary and Secondary

3.4.2.1.5 Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

The following lists encompass materials, environments, aging effects requiring management, and aging management programs for the series 3.4.2-5-x tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Carbon steel
- Glass
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Steam
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with nonsafety-related components affecting safety-related systems require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – erosion
- Loss of material – FAC
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – Primary and Secondary

3.4.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.4.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG 1800 and explain the approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.4.2.2.1 Cumulative Fatigue Damage

Where identified as an aging effect requiring management, the analysis of fatigue is a TLAA as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). Evaluation of this TLAA is addressed in Section 4.3.

3.4.2.2.2 Cracking due to Stress Corrosion Cracking (SCC)

Cracking due to stress corrosion cracking could occur for stainless steel piping, piping components, piping elements and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. Consistent with

NUREG-1801, cracking of stainless steel components exposed to outdoor air, including indoor components accessible to outdoor air, is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program.

3.4.2.2.3 Loss of Material Due to Pitting and Crevice Corrosion

Loss of material due to pitting and crevice corrosion could occur for stainless steel piping, piping components, piping elements, and tanks exposed to outdoor air, including air which has recently been introduced into buildings, such as near intake vents. WF3 is located near other industrial facilities, including chemical manufacturers. Chloride contamination of components exposed to outdoor air may occur. Consistent with NUREG-1801, loss of material for stainless steel components exposed to outdoor air, including indoor components accessible to outdoor air, is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program.

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of WF3 quality assurance procedures and administrative controls for aging management programs.

3.4.2.2.5 Ongoing Review of Operating Experience

See Appendix B Section B.0.4 for discussion of the WF3 operating experience review programs.

3.4.2.2.6 Loss of Material due to Recurring Internal Corrosion

A review of 10 years of plant operating experience identified no conditions of recurring internal corrosion (RIC) as defined in LR-ISG 2012-02, Section A, in the piping components of the steam and power conversion systems in the scope of license renewal.

3.4.2.3 Time-Limited Aging Analysis

The only time-limited aging analysis identified for the steam and power conversion systems components is metal fatigue. This is evaluated in Section 4.3.

3.4.3 Conclusion

The steam and power conversion system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on steam and power conversion system components are identified in Section 3.4.2.1 and in the following tables. 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 steam and power conversion system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.4.1
Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-1	Steel piping, piping components, and piping elements exposed to steam or treated water	Cumulative fatigue damage due to fatigue	Fatigue is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the SRP, Section 4.3 "Metal Fatigue," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	Fatigue is a TLAA. See Section 3.4.2.2.1.
3.4.1-2	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Cracking due to stress corrosion cracking	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Consistent with NUREG-1801. Cracking of stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program. See Section 3.4.2.2.2.
3.4.1-3	Stainless steel piping, piping components, and piping elements; tanks exposed to air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	Yes, environmental conditions need to be evaluated	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program. See Section 3.4.2.2.3.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-4	Steel external surfaces, bolting exposed to air with borated water leakage	Loss of material due to boric acid corrosion	Chapter XI.M10, “Boric Acid Corrosion”	No	There are no external steel surfaces exposed to borated water in the steam and power conversion systems.
3.4.1-5	Steel piping, piping components, and piping elements exposed to steam, treated water	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, “Flow-Accelerated Corrosion”	No	Consistent with NUREG-1801. Loss of material due to flow accelerated corrosion in steel components exposed to steam or treated water is managed by the Flow-Accelerated Corrosion Program.
3.4.1-6	Steel, stainless steel bolting exposed to soil	Loss of preload	Chapter XI.M18, "Bolting Integrity "	No	There are no components exposed to soil in the steam and power conversion systems in the scope of license renewal.
3.4.1-7	High-strength steel closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity "	No	Consistent with NUREG-1801. Cracking of high strength steel bolting exposed to air with steam or water leakage is managed by the Bolting Integrity Program.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-8	Steel; stainless steel bolting, closure bolting exposed to air – outdoor (external), air – indoor, uncontrolled (external)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity "	No	Consistent with NUREG-1801. Loss of material for steel and stainless steel closure bolting exposed to indoor and outdoor air is managed by the Bolting Integrity Program. Loss of material is not an aging effect for stainless steel closure bolting in indoor air unless exposed to prolonged leakage (an event driven condition). Nevertheless, the Bolting Integrity Program also applies to stainless steel bolting exposed to indoor air.
3.4.1-9	Steel closure bolting exposed to air with steam or water leakage	Loss of material due to general corrosion	Chapter XI.M18, "Bolting Integrity "	No	As stated in Item 3.4.1-8, loss of material of steel bolting exposed to air in the steam and power conversion systems is managed by the Bolting Integrity Program. However, steam or water leakage is not considered as a separate aspect of the indoor air environment.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-10	Copper alloy, nickel alloy, steel; stainless steel, steel; stainless steel bolting, closure bolting exposed to any environment, air – outdoor (external), air – indoor, uncontrolled (external)	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity "	No	Consistent with NUREG-1801. Loss of preload for steel and stainless steel bolting is managed by the Bolting Integrity Program. Copper alloy and nickel alloy bolting is not included in the scope of license renewal for steam and power conversion systems.
3.4.1-11	Stainless steel piping, piping components, and piping elements, tanks, heat exchanger components exposed to steam, treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	Consistent with NUREG-1801. Cracking of stainless steel components exposed to steam or treated water >60°C (>140°F) is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage cracking.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-12	Steel; stainless steel tanks exposed to treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One- Time Inspection"	No	Consistent with NUREG-1801. Loss of material for steel tanks exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. There are no stainless steel tanks exposed to treated water in the steam and power conversion systems in the scope of license renewal.
3.4.1-13	Steel piping, piping components, and piping elements exposed to treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One- Time Inspection"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-14	Steel piping, piping components, and piping elements, PWR heat exchanger components exposed to steam, treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel components exposed to steam or treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.
3.4.1-15	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	There are no steel condensate system heat exchanger components exposed to treated water in the steam and power conversion systems in the scope of license renewal.
3.4.1-16	Copper alloy, stainless steel, nickel alloy, aluminum piping, piping components, and piping elements, heat exchanger components and tubes, PWR heat exchanger components exposed to treated water, steam	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to steam or treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. There are no aluminum, copper alloy or nickel alloy components in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-17	Copper alloy heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	There are no copper alloy heat exchanger tubes with an intended function of heat transfer in the steam and power conversion systems in the scope of license renewal.
3.4.1-18	Copper alloy, stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	Consistent with NUREG-1801. Reduction of heat transfer for stainless steel heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – Primary and Secondary Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. There are no copper alloy heat exchanger tubes with an intended function of heat transfer in the steam and power conversion systems in the scope of license renewal.
3.4.1-19	Stainless steel, steel heat exchanger components exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no steel or stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-20	Copper alloy, stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no copper alloy or stainless steel components exposed to raw water in the steam and power conversion systems in the scope of license renewal.
3.4.1-21	Stainless steel heat exchanger components exposed to raw water	Loss of material due to pitting, crevice, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no stainless steel heat exchanger components exposed to raw water in the steam and power conversion systems in the scope of license renewal.
3.4.1-22	Stainless steel, copper alloy, steel heat exchanger tubes, heat exchanger components exposed to raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	There are no heat exchanger tubes exposed to raw water with an intended function of heat transfer in the steam and power conversion systems in the scope of license renewal.
3.4.1-23	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no stainless steel components exposed to closed-cycle cooling water >60°C (>140°F) in the steam and power conversion systems in the scope of license renewal.
3.4.1-24	Steel heat exchanger components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no steel components exposed to closed-cycle cooling water in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-25	Steel heat exchanger components exposed to closed-cycle cooling water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no steel components exposed to closed-cycle cooling water in the steam and power conversion systems in the scope of license renewal.
3.4.1-26	Stainless steel heat exchanger components, piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to pitting and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no stainless steel components exposed to closed-cycle cooling water in the steam and power conversion systems in the scope of license renewal.
3.4.1-27	Copper alloy piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to pitting, crevice, and galvanic corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no copper alloy components exposed to closed-cycle cooling water in the steam and power conversion systems in the scope of license renewal.
3.4.1-28	Steel, stainless steel, copper alloy heat exchanger components and tubes, heat exchanger tubes exposed to closed-cycle cooling water	Reduction of heat transfer due to fouling	Chapter XI.M21A, "Closed Treated Water Systems"	No	There are no steel, stainless steel or copper alloy components exposed to closed-cycle cooling water in the steam and power conversion systems in the scope of license renewal.
3.4.1-29	Steel tanks exposed to air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	There are no steel tanks exposed to outdoor air in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-30	Steel, stainless steel, aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to general (steel only), pitting, and crevice corrosion; cracking due to stress corrosion cracking (stainless steel and aluminum only)	Chapter XI.M29, “Aboveground Metallic Tanks”	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank constructed on soil or concrete in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.
3.4.1-31	Stainless steel, aluminum tanks (within the scope of Chapter XI.M29, “Aboveground Metallic Tanks”) exposed to soil or concrete, or the following external environments air-outdoor, air-indoor uncontrolled, moist air, condensation	Loss of material due to pitting, and crevice corrosion; cracking due to stress corrosion cracking	Chapter XI.M29, “Aboveground Metallic Tanks”	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank constructed on soil or concrete in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.
3.4.1-32	Gray cast iron piping, piping components, and piping elements exposed to soil	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	There are no components exposed to soil in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-33	Gray cast iron, copper alloy (>15% Zn or >8% Al) piping, piping components, and piping elements exposed to treated water, raw water, closed-cycle cooling water	Loss of material due to selective leaching	Chapter XI.M33, “Selective Leaching”	No	Consistent with NUREG-1801. Loss of material for gray cast iron components exposed to treated water is managed by the Selective Leaching Program. Other material environment combinations represented by this item are not applicable to steam and power conversion system components in the scope of license renewal.
3.4.1-34	Steel external surfaces exposed to air – indoor, uncontrolled (external), air – outdoor (external), condensation (external)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to indoor or outdoor air is managed by the External Surfaces Monitoring Program. There are no uninsulated steel components exposed to condensation in the steam and power conversion systems in the scope of license renewal.
3.4.1-35	Aluminum piping, piping components, and piping elements exposed to air - outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no aluminum components exposed to outdoor air in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-36	Steel piping, piping components, and piping elements exposed to air – outdoor (internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for internal surfaces of steel components exposed to outdoor air (Tables 3.3.2-X) is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
3.4.1-37	Steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no steel components exposed to condensation in the steam and power conversion systems in the scope of license renewal.
3.4.1-38	Steel piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, galvanic, and microbiologically-influenced corrosion; fouling that leads to corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no steel components exposed to raw water in the steam and power conversion systems in the scope of license renewal.
3.4.1-39	Stainless steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	There are no stainless steel components exposed to condensation in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-40	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.
3.4.1-41	Steel heat exchanger components exposed to lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel heat exchanger components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.
3.4.1-42	Aluminum piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	There are no aluminum components exposed to lube oil in the steam and power conversion systems in the scope of license renewal.
3.4.1-43	Copper alloy piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to pitting and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	There are no copper alloy components exposed to lube oil in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-44	Stainless steel piping, piping components, and piping elements, heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.
3.4.1-45	Aluminum heat exchanger components and tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	There are no aluminum components exposed to lube oil in the steam and power conversion systems in the scope of license renewal.
3.4.1-46	Stainless steel, steel, copper alloy heat exchanger tubes exposed to lubricating oil	Reduction of heat transfer due to fouling	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Reduction of heat transfer for stainless steel heat exchanger tubes exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material. There are no steel or copper alloy heat exchanger tubes with a heat transfer intended function in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-47	Steel (with coating or wrapping), stainless steel, nickel alloy piping, piping components, and piping elements; tanks exposed to soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no components exposed to soil or concrete in the steam and power conversion systems in the scope of license renewal.
3.4.1-48	Stainless steel, nickel alloy bolting exposed to soil	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no components exposed to soil in the steam and power conversion systems in the scope of license renewal.
3.4.1-49	Stainless steel, nickel alloy piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no components exposed to soil or concrete in the steam and power conversion systems in the scope of license renewal.
3.4.1-50	Steel bolting exposed to soil	Loss of material due to general, pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no components exposed to soil in the steam and power conversion systems in the scope of license renewal.
3.4.1-50.5	Underground stainless steel, nickel alloy, steel piping, piping components, and piping elements	Loss of material due to general (steel only), pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	There are no underground components in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-51	Steel piping, piping components, and piping elements exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant OE indicates no degradation of the concrete	No, if conditions are met.	There are no steel components embedded in concrete in the steam and power conversion systems in the scope of license renewal.
3.4.1-52	Aluminum piping, piping components, and piping elements exposed to gas, air – indoor, uncontrolled (internal/ external)	None	None	NA – No AEM or AMP	There are no aluminum components in the steam and power conversion systems in the scope of license renewal.
3.4.1-53	Copper alloy (≤15% Zn and ≤8% Al) piping, piping components, and piping elements exposed to air with borated water leakage	None	None	NA - No AEM or AMP	There are no copper alloy (≤15% Zn and ≤8% Al) components in the steam and power conversion systems in the scope of license renewal.
3.4.1-54	Copper alloy piping, piping components, and piping elements exposed to gas, air – indoor, uncontrolled (external)	None	None	NA – No AEM or AMP	There are no copper alloy components in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-55	Glass piping elements exposed to lubricating oil, air – outdoor, condensation (internal/ external), raw water, treated water, air with borated water leakage, gas, closed-cycle cooling water, air – indoor, uncontrolled (external)	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air, condensation, lube oil and treated water) environments.
3.4.1-56	Nickel alloy piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external)	None	None	NA – No AEM or AMP	There are no nickel alloy components in the steam and power conversion systems in the scope of license renewal.
3.4.1-57	Nickel alloy, PVC piping, piping components, and piping elements exposed to air with borated water leakage, air – indoor, uncontrolled, condensation (internal)	None	None	NA – No AEM or AMP	There are no nickel alloy or PVC components in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-58	Stainless steel piping, piping components, and piping elements exposed to air – indoor, uncontrolled (external), concrete, gas, air – indoor, uncontrolled (internal)	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for relevant (indoor air) environment.
3.4.1-59	Steel piping, piping components, and piping elements exposed to air – indoor controlled (external), gas	None	None	NA – No AEM or AMP	There are no steel steam and power conversion system components exposed to controlled indoor air or gas in the scope of license renewal.
3.4.1-60	Any material, piping, piping components, and piping elements exposed to treated water	Wall thinning due to erosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801. Loss of material due to erosion for steel components exposed to treated water is managed by the Flow-Accelerated Corrosion Program.
3.4.1-61	Metallic piping, piping components, and tanks exposed to raw water or waste water	Loss of material due to recurring internal corrosion	A plant-specific aging management program is to be evaluated to address recurring internal corrosion	Yes, plant-specific	Recurring internal corrosion was not identified in the WF3 steam and power conversion systems in the scope of license renewal. See Section 3.4.2.2.6.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-62	Steel, stainless steel or aluminum tanks (within the scope of Chapter XI.M29, "Aboveground Metallic Tanks") exposed to treated water	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	At WF3, there are no tanks within the scope of Chapter XI.M29, Aboveground Metallic Tanks. The only outdoor tank in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.
3.4.1-63	Insulated steel, stainless steel, copper alloy, aluminum, or copper alloy (> 15% Zn) piping, piping components, and tanks exposed to condensation, air-outdoor	Loss of material due to general (steel, and copper alloy), pitting, or crevice corrosion, and cracking due to stress corrosion cracking (aluminum, stainless steel and copper alloy (>15% Zn) only)	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components" or Chapter XI.M29, "Aboveground Metallic Tanks" (for tanks only)	No	Consistent with NUREG-1801 for insulated carbon steel and stainless steel components exposed to outdoor air. Loss of material and cracking (stainless steel only) is managed by the External Surfaces Monitoring Program. There are no insulated aluminum or copper alloy piping components in the steam and power conversion systems in the scope of license renewal.
3.4.1-64	Jacketed calcium silicate or fiberglass insulation in an air-indoor uncontrolled or air-outdoor environment	Reduced thermal insulation resistance due to moisture intrusion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Reduced thermal insulation resistance due to moisture intrusion of jacketed calcium silicate or fiberglass insulation is managed by the External Surfaces Monitoring Program. This item applies to aging management review results presented in Table 3.5.2-4.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-65	Jacketed foamglas ® (glass dust) insulation in an air-indoor uncontrolled or air-outdoor environment	Reduced thermal insulation resistance due to moisture intrusion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	There are no insulation components with an intended function of thermal insulation in the steam and power conversion systems.
3.4.1-66	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of coating or lining integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage, and spalling for cementitious coatings/linings	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	There are no metallic components with internal coating or linings in the steam and power conversion systems in the scope of license renewal.
3.4.1-67	Metallic piping, piping components, heat exchangers, tanks with internal coatings/linings exposed to closed-cycle cooling water, raw water, treated water, treated borated water, or lubricating oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	There are no metallic components with internal coating or linings in the steam and power conversion systems in the scope of license renewal.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-68	Gray cast iron piping components with internal coatings/linings exposed to closed-cycle cooling water, raw water, or treated water	Loss of material due to selective leaching	Chapter XI.M42, “Internal Coatings/Linings for In-Scope Piping, Piping Components, Heat Exchangers, and Tanks”	No	There are no gray cast iron components with internal coatings or linings in the steam and power conversion systems in the scope of license renewal.

Notes for Table 3.4.2-1 through 3.4.2-5-6

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

401. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

402. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

403. The CASS flow elements were evaluated and determined to not be susceptible to thermal aging embrittlement.

404. These components have openings that expose the internal surfaces to outdoor air. Because the internal and external surfaces are exposed to the same environments, aging effects of the internal surfaces can be inferred from external surface conditions.

405. For the purposes of evaluating loss of coating integrity and loss of material, this environment can be considered equivalent to the NUREG-1801 environment.

Table 3.4.2-1
Condensate Makeup and Storage System
Summary of Aging Management Evaluation

Table 3.4.2-1: Condensate Makeup and Storage System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Flow element	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Flow element	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-1: Condensate Makeup and Storage System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	External Surfaces Monitoring	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-1: Condensate Makeup and Storage System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-2
Emergency Feedwater System
Summary of Aging Management Evaluation

Table 3.4.2-2: Emergency Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	VIII.H.S-03	3.4.1-7	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Coil	Heat transfer	Stainless steel	Lube oil (ext)	Reduction of heat transfer	Oil Analysis	VIII.G.SP-102	3.4.1-46	A, 402
Coil	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VIII.G.SP-79	3.4.1-44	A, 402

Table 3.4.2-2: Emergency Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Coil	Heat transfer	Stainless steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	VIII.E.SP-96	3.4.1-18	C, 401
Coil	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G.SP-87	3.4.1-16	C, 401
Heat exchanger (housing)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (housing)	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VIII.G.SP-76	3.4.1-41	A, 402
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.G.S-402	3.4.1-63	A
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G.SP-74	3.4.1-13	A, 401

Table 3.4.2-2: Emergency Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G.SP-87	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.G.SP-74	3.4.1-13	A, 401

Table 3.4.2-3
Main Feedwater System
Summary of Aging Management Evaluation

Table 3.4.2-3: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	VIII.H.S-03	3.4.1-7	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Cracking	Bolting Integrity	--	--	G
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B

Table 3.4.2-3: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.D1.S-402	3.4.1-63	A
Orifice	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.D1.SP-118	3.4.1-2	A
Orifice	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.D1.SP-127	3.4.1-3	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-88	3.4.1-11	A, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3: Main Feedwater System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.D1.SP-118	3.4.1-2	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.D1.SP-127	3.4.1-3	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-3: Main Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-88	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	A, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-3: Main Feedwater System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.A.SP-98	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-155	3.4.1-16	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-88	3.4.1-11	A, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401

Table 3.4.2-4
Main Steam System
Summary of Aging Management Evaluation

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bearing housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Bearing housing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Bearing housing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VIII.A.SP-27	3.4.1-33	C
Bearing housing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	A, 401
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Cracking	Bolting Integrity	VIII.H.S-03	3.4.1-7	B
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B

Table 3.4.2-4: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	High strength steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Cracking	Bolting Integrity	--	--	G
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	High strength steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Flow element	Pressure boundary Flow control	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A

Table 3.4.2-4: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Pressure boundary Flow control	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Flow element	Pressure boundary Flow control	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Flow element	Pressure boundary Flow control	CASS	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401 403
Flow element	Pressure boundary Flow control	CASS	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Flow element	Pressure boundary Flow control	CASS	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	C
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.G.SP-76	3.4.1-41	C, 402

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.G.SP-79	3.4.1-44	C, 402
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 401
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VIII.G.SP-79	3.4.1-44	C, 402
Heat exchanger (tubes)	Heat transfer	Stainless steel	Lube oil (ext)	Reduction of heat transfer	Oil Analysis	VIII.G.SP-102	3.4.1-46	C, 402
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 401
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Reduction of heat transfer	Water Chemistry Control – Primary and Secondary	VIII.E.SP-96	3.4.1-18	C, 401
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.S-402	3.4.1-63	A
Insulated piping components	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.B1.S-402	3.4.1-63	A
Insulated piping components	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.S-402	3.4.1-63	A
Nozzle	Pressure boundary Flow control	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401

Table 3.4.2-4: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Nozzle	Pressure boundary Flow control	Stainless steel	Steam (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Nozzle	Pressure boundary Flow control	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Nozzle	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Nozzle	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Nozzle	Pressure boundary Flow control	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Orifice	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Orifice	Pressure boundary Flow control	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Orifice	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Orifice	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Orifice	Pressure boundary Flow control	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material – erosion	Flow-Accelerated Corrosion	--	--	H
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.B1.SP-118	3.4.1-2	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.SP-127	3.4.1-3	A
Piping	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VIII.I.SP-10	3.4.1-55	A
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Thermowell	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Tubing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.B1.SP-118	3.4.1-2	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.SP-127	3.4.1-3	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Tubing	Pressure boundary	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Steam (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Tubing	Pressure boundary	Stainless steel	Steam (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Turbine casing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-4: Main Steam System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.B1.SP-118	3.4.1-2	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.SP-127	3.4.1-3	A
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401

Table 3.4.2-5-1
Blowdown System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-5-1:Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Accumulator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Accumulator	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Demineralizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Demineralizer	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	A, 401
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Filter housing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.4.2-5-1:Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-78	3.4.1-14	A, 401
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 401
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C

Table 3.4.2-5-1:Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – erosion	Flow-Accelerated Corrosion	VIII.D1.S-408	3.4.1-60	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.F.S-16	3.4.1-5	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	A, 401
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.F.S-16	3.4.1-5	A
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-5-1:Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Pump casing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	A, 401
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I.SP-35	3.4.1-55	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	A, 401
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Tank	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 401

Table 3.4.2-5-1:Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-75	3.4.1-12	C, 401
Tank	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 401
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C

Table 3.4.2-5-1:Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	A, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.A.S-16	3.4.1-5	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.4.2-5-2
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-5-2:Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material – erosion	Flow-Accelerated Corrosion	VIII.D1.S-408	3.4.1-60	C
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-5-2:Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VIII.I.SP-35	3.4.1-55	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E

Table 3.4.2-5-3
Condensate Makeup and Storage System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-5-3:Condensate Makeup and Storage System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-5-3:Condensate Makeup and Storage System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401

Table 3.4.2-5-4
Emergency Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-5-4:Emergency Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	A, 401

Table 3.4.2-5-5
Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-5-5:Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.D1.S-402	3.4.1-63	A
Orifice	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.D1.SP-118	3.4.1-2	A
Orifice	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.D1.SP-127	3.4.1-3	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	A, 401

Table 3.4.2-5-6
Main Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-5-6:Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	B
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	B
Insulated piping components	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.S-402	3.4.1-63	A
Module	Support for criterion (a)(1) equipment	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Module	Support for criterion (a)(1) equipment	Carbon steel	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	--	--	G, 404
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A

Table 3.4.2-5-6:Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Strainer housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Strainer housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-5-6:Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Trap	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Trap	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Trap	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Trap	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.B1.SP-118	3.4.1-2	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.SP-127	3.4.1-3	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-5-6:Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-71	3.4.1-14	A, 401
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material – FAC	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.B1.SP-118	3.4.1-2	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.B1.SP-127	3.4.1-3	A

Table 3.4.2-5-6:Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	A, 401

3.5 CONTAINMENTS, STRUCTURES AND COMPONENT SUPPORTS

3.5.1 Introduction

This section provides the results of the aging management review for structural components and commodities that are subject to aging management review. The following structures and commodity groups are addressed in this section (descriptions are available in the referenced sections).

- Reactor Building (Section 2.4.1)
- Nuclear Plant Island Structure (Section 2.4.2)
- Turbine Building and Other Structures (Section 2.4.3)
- Bulk Commodities (Section 2.4.4)

Table 3.5.1, Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for structures and component supports. Hyperlinks are provided to the program evaluations in Appendix B.

3.5.2 Results

The following tables summarize the results of aging management reviews and the NUREG-1801 comparison for structures and component supports.

- Table 3.5.2-1 Reactor Building - Summary of Aging Management Evaluation
- Table 3.5.2-2 Nuclear Plant Island Structure - Summary of Aging Management Evaluation
- Table 3.5.2-3 Turbine Building and Other Structures - Summary of Aging Management Evaluation
- Table 3.5.2-4 Bulk Commodities - Summary of Aging Management Evaluation

3.5.2.1 Materials, Environments, Aging Effects Requiring Management and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for structures and component supports subject to aging management review. Programs are described in Appendix B. Further details are provided in the structure and commodities tables.

3.5.2.1.1 Reactor Building

Materials

Reactor building components are constructed of the following materials.

- Carbon steel
- Coatings
- Concrete
- Elastomer
- Stainless steel

Environments

Reactor building components are exposed to the following environments.

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Exposed to fluid environment

Aging Effects Requiring Management

The following aging effects associated with the reactor building require management.

- Cracking
- Increase in porosity and permeability
- Loss of bond
- Loss of coating integrity
- Loss of leak tightness
- Loss of material
- Loss of preload
- Loss of sealing

Aging Management Programs

The following aging management programs manage the effects of aging on the reactor building.

- Boric Acid Corrosion
- Containment Inservice Inspection – IWE
- Containment Leak Rate
- Fire Protection
- Inservice Inspection – IWF

- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Protective Coating Monitoring and Maintenance
- Structures Monitoring

3.5.2.1.2 Nuclear Plant Island Structure

Materials

Nuclear plant island structure components are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel
- Stainless steel

Environments

Nuclear plant island structure components are exposed to the following environments.

- Air – indoor uncontrolled
- Air – outdoor
- Exposed to fluid environment
- Soil

Aging Effects Requiring Management

The following aging effects associated with the nuclear plant island structure require management.

- Cracking
- Cracks and distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of strength

Aging Management Programs

The following aging management programs manage the effects of aging on the nuclear plant island structure components.

- Fire Protection

- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Masonry Wall
- Structures Monitoring
- Water Chemistry Control – Primary and Secondary

3.5.2.1.3 Turbine Building and Other Structures

Materials

Turbine building and other structures are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Galvanized steel
- Treated wood

Environments

Turbine building and other structures components are exposed to the following environments.

- Air – indoor uncontrolled
- Air – outdoor
- Exposed to fluid environment
- Soil

Aging Effects Requiring Management

The following aging effects associated with the turbine building and other structures require management.

- Change in material properties
- Cracking
- Cracks and distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- Loss of strength

Aging Management Programs

The following aging management programs manage the effects of aging on the turbine building and other structures components.

- Fire Protection
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Masonry Wall
- Structures Monitoring

3.5.2.1.4 Bulk Commodities

Materials

Bulk commodity components are constructed of the following materials.

- Aluminum
- Calcium silicate
- Carbon steel
- Cerablanket
- Concrete
- Elastomers
- Fiberglass
- Galvanized steel
- HEMYC
- Kaowool blanket
- Silicone elastomer
- Siltemp fibersil cloth
- Stainless steel
- Thermo-lag

Environments

Bulk commodity components are exposed to the following environments.

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Exposed to fluid environment

Aging Effects Requiring Management

The following aging effects associated with the bulk commodities require management.

- Change in material properties
- Cracking
- Cracking/delamination, separation
- Increase in porosity and permeability
- Increased hardness, shrinkage, loss of strength
- Loss of bond
- Loss of material
- Loss of mechanical function
- Loss of preload
- Loss of sealing
- Reduction in concrete anchor capacity
- Reduction or loss of isolation function

Aging Management Programs

The following aging management programs manage the effects of aging on the bulk commodity components.

- Boric Acid Corrosion
- External Surfaces Monitoring
- Fire Protection
- Fire Water System
- Inservice Inspection – IWF
- Structures Monitoring
- Water Chemistry Control – Primary and Secondary

3.5.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues discussed in Section 3.5.2.2 of NUREG-1800. The following sections are numbered in accordance with the discussions in NUREG-1800 and explain the WF3 approach to those areas requiring further evaluation. Programs are described in Appendix B.

3.5.2.2.1 PWR and BWR Containments

3.5.2.2.1.1 Cracking and Distortion due to Increased Stress Levels from Settlement; Reduction of Foundation Strength, and Cracking due to Differential Settlement and Erosion of Porous Concrete Subfoundations

The WF3 containment is a low-leakage free-standing steel containment vessel (SCV) structure consisting of a cylindrical wall, a hemispherical dome, and an ellipsoidal bottom liner plate encased in concrete which is completely enclosed by the reinforced concrete shield building. The WF3 SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS that is founded on a compacted shell filter blanket, which is supported by the Pleistocene sediments. The portion of WF3's containment that is classified as Class CC equivalent is the common concrete foundation with the shield building. Since the Class CC equivalent concrete foundation slab is inaccessible, it is exempted from examination in accordance with IWL-1220(b). However, the listed aging effects will be addressed under the concrete foundation for the safety-related shield building and the common rigid reinforced concrete foundation structure for the NPIS, as discussed in Section 3.5.2.2.2.1 Item 3.

WF3 does not rely on a dewatering system for control of settlement. The WF3 SCV structure's base foundation is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS and does not use a porous concrete subfoundation. Additionally, Information Notice 97-11 did not identify WF3 as a plant susceptible to erosion of porous concrete subfoundations. Therefore, reduction of foundation strength, cracking due to differential settlement, and erosion of porous concrete subfoundations is not applicable to the WF3 SCV structure's base foundation concrete.

3.5.2.2.1.2 Reduction of Strength and Modulus due to Elevated Temperature

The WF3 containment is a low-leakage free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome and an ellipsoidal bottom liner plate encased in concrete. The WF3 SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS that is founded on a compacted shell filter blanket, which is supported by the Pleistocene sediments. The portion of WF3's containment that is classified as Class CC equivalent is the common concrete foundation with the shield building. Since the Class CC equivalent concrete foundation slab is inaccessible, it is exempted from examination in accordance with IWL-1220(b). However, the listed aging effects will be addressed under the concrete foundation for the safety-related shield building and the common rigid reinforced concrete foundation structure for the NPIS and further discussed in Section 3.5.2.2.2.2.

During normal operation, areas within containment are maintained below an average temperature of 120ºF per technical specifications, which is below the threshold temperature of greater than 150°F general area. Process piping carrying hot fluid (pipe temperature greater than 200ºF) are routed through penetrations in the SCV that are not encased in concrete. Therefore, the local area temperatures greater than 200ºF local is not applicable for the WF3 containment. Therefore, change in material properties due to elevated temperature is not an aging effect requiring management for containment concrete.

As a result, reduction of strength and modulus of concrete due to elevated temperatures are not aging effects requiring management for the WF3 free-standing SCV structure. The aging effect “change in material properties” is equivalent to the NUREG-1801 aging effect “reduction of strength and modulus of elasticity.”

3.5.2.2.1.3 Loss of Material due to General, Pitting and Crevice Corrosion

1. Loss of material due to general, pitting, and crevice corrosion could occur in steel elements of inaccessible areas for all types of PWR and BWR containments.

The WF3 containment is a low-leakage free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome and an ellipsoidal bottom liner plate encased in concrete. The WF3 SCV structure’s base foundation is integral with the base foundation of the shield building. A moisture barrier is provided where the steel liner becomes embedded in the concrete floor. The SCV is inspected in accordance with the requirements of Subsection IWE of the ASME Code Section XI. These inspections include a visual examination of the accessible interior and the exterior surfaces of the class MC components, parts and appurtenances of the steel containment vessel as well as visual inspection of the moisture barrier at the concrete-to-steel interface. Loss of material due to general, pitting and crevice corrosion of the steel elements of accessible areas is managed by the Containment Inservice Inspection – IWE Program, the Containment Leak Rate Program (10 CFR Part 50, Appendix J Program) and the Boric Acid Corrosion Program. Interior concrete is monitored for cracks under the Structures Monitoring Program.

Moisture barriers are intended to prevent intrusion of moisture against inaccessible areas of the pressure retaining metal containment shell or liner at concrete-to-metal interfaces and at metal-to-metal interfaces which are not seal welded. The WF3 moisture barrier is the elastomeric sealant between the concrete to metal containment interface.

A review of plant operating experience was conducted from the Containment Inservice Inspection – IWE Program walkdowns. One condition report identified during the performance of visual inspections of the containment during VT-3 inspection of the containment inner moisture barrier (located between the containment vessel and the concrete floor on the ledge on elevation -4), six damaged locations of the moisture barrier. Damage was primarily age related degradation and mechanical damage to the moisture barrier. The containment moisture barrier is intended to provide long term corrosion protection of the containment vessel. It is not required by Technical Specifications or the Technical Requirements Manual and is not required to support the function of any safety-related structures, systems or components. None of the affected areas showed signs of wetting and no corrosion of the containment vessel was noted. Corrective action removed the damaged portions of moisture barrier and replaced them with new sealant barrier material.

The continued monitoring of the WF3 steel containment vessel for loss of material due to general, pitting, and crevice corrosion through the Containment Inservice Inspection – IWE Program and the Containment Leak Rate Program provides reasonable assurance that loss of material in inaccessible areas of Containment is insignificant and will be detected prior to a loss of an intended function.

2. Loss of material due to general, pitting, and crevice corrosion could occur in steel torus shell of Mark I containments.

   WF3 is a PWR with a free-standing SCV comprised of a cylindrical wall, a hemispherical dome, and an ellipsoidal bottom liner plate encased in concrete. The WF3 PWR containment does not have a steel torus shell. Therefore, this item does not apply to WF3.

3. Loss of material due to general, pitting, and crevice corrosion could occur in steel torus ring girders and downcomers of Mark I containments, downcomers of Mark II containments, and interior surface of suppression chamber shell of Mark III containments.

   WF3 is a PWR with a free-standing SCV comprised of a cylindrical wall, a hemispherical dome, and an ellipsoidal bottom liner plate encased in concrete. The WF3 PWR containment does not have a torus ring girder or downcomers. Therefore this item does not apply to WF3.

3.5.2.2.1.4 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

WF3 is a PWR with a free-standing SCV comprised of a cylindrical wall, a hemispherical dome, and an ellipsoidal bottom liner plate encased in concrete. The WF3 SCV structure’s base foundation is integral with the base foundation of the shield building with no prestressed tendons associated with its design. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature does not apply.

3.5.2.2.1.5 Cumulative Fatigue Damage

TLAAs are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. By design, the WF3 steel containment vessel is not subject to a TLAA. Fatigue TLAAs for bellows are evaluated as documented in Section 4.6. Other containment mechanical penetration bellows that are located outside the containment building have been screened out of scope because they do not perform a pressure boundary intended function and no fatigue analysis exists.

The NUREG-1801 BWR components, e.g., torus, suppression pool shell, vent line bellows, and unbraced downcomers, related to Mark I and II containments are not applicable to the WF3 PWR containment.

3.5.2.2.1.6 Cracking due to Stress Corrosion Cracking

Stress corrosion cracking (SCC) is not an applicable aging mechanism for the steel containment vessel (SCV) carbon steel penetration sleeves, stainless steel penetration bellows, and dissimilar metal welds. The WF3 SCV and associated penetration sleeves are carbon steel. High temperature piping systems penetrating the containment are carbon steel. Stress corrosion cracking is only applicable to stainless steel and is predicted only under certain conditions. There are dissimilar metal welds associated with stainless steel bellows welded to carbon steel penetration sleeves. SCC of dissimilar metal welds of stainless steel at the penetration sleeves is not considered credible because stainless steel SCC requires a concentration of chloride or sulfate contaminants, which are not normally present in significant quantities, as well as high stress and temperatures greater than 140°F. Leakage of water in the containment, which might contact the penetration sleeves, is event driven. The containment pressure boundary welds between stainless steel piping and penetration sleeves, with normal operating temperatures above 140°F, are not highly stressed. In addition, the Technical Specification limits the average air temperature inside the primary containment during normal plant operation to 120°F. Therefore cracking of these components due to stress corrosion cracking is not applicable. However, cracking due to SCC of dissimilar metal welds for carbon steel and stainless steel will be managed by the Containment Inservice Inspection – IWE Program and the Containment Leak Rate Program.

NUREG-1801 recommends further evaluation of inspection methods to detect cracking due to stress corrosion cracking (SCC) since visual VT-3 examinations may be unable to detect this aging effect. Potentially susceptible components at WF3 are penetration sleeves and bellows.

Three factors are necessary to initiate and propagate cracking due to SCC, including transgranular stress corrosion cracking (TGSCC). These factors are susceptible or sensitized material (resulting from manufacturing or installation process), a high tensile stress (residual or applied), and corrosive environment (high temperatures, moist or wetted environment or an environment contaminated with chlorides, fluorides, or sulfates). Elimination or reduction of any of these factors will decrease the likelihood of SCC. TGSCC of WF3 stainless steel bellows is not considered credible because the corrosive environment (concentration of chloride or sulfate contaminants and temperatures greater than 140°F) does not exist for the bellows. Therefore, SCC of WF3 stainless steel bellows due to TGSCC is not expected. A review of plant operating experience did not identify cracking of this component, and containment pressure boundary functions have not been identified as a concern.

SCC is not an applicable aging mechanism for the SCV carbon steel penetration sleeves, and dissimilar metal welds. The WF3 SCV and associated penetration sleeves are carbon steel. High temperature piping systems penetrating the containment are generally carbon steel. Stress corrosion cracking is only applicable to stainless steel and is predicted only under certain conditions as discussed above. SCC of dissimilar metal welds of stainless steel at the penetration sleeves is not considered credible because stainless steel SCC requires a concentration of chloride or sulfate contaminants, which are not present in significant quantities, as well as high stress and temperatures greater than 140°F. Leakage of water in the containment, which might contact the penetration sleeves, is not the normal operating environment. The containment pressure boundary welds between stainless steel piping and penetration sleeves, with normal operating temperatures above 140°F, are not highly stressed. In addition, the Technical Specification limits the average air temperature inside the primary containment during normal plant operation to 120°F. A review of plant operating experience did not identify cracking of these components, and containment pressure boundary functions have not been identified as a concern. Therefore, cracking of these components due to stress corrosion cracking is not expected. Nevertheless, the Containment Inservice Inspection – IWE Program and the Containment Leak Rate Program manage cracking due to SCC of stainless steel bellows and dissimilar metal welds for carbon steel and stainless steel.

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking due to Freeze-Thaw

The WF3 containment is a low-leakage free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome and an ellipsoidal bottom liner plate encased in concrete. The WF3 SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS that is founded on a compacted shell filter blanket, which is supported by the Pleistocene sediments. The portion of WF3's containment that is classified as Class CC equivalent is the common concrete foundation with the shield building. Since the Class CC equivalent concrete foundation slab is inaccessible, it is exempted from examination in accordance with IWL-1220(b). The base foundation of the SCV is below grade and protected from the outer environment by the shield building's base foundation and is not subject to freeze-thaw action.

The WF3 concrete structures subject to the air-outdoor environment are not exposed to temperatures of 32°F or less of sufficient durations that would cause freeze-thaw aging effects to occur. WF3 is located in a "Negligible" weathering region per Figure 1 of ASTM C33-90.

As a result, loss of material and cracking due to freeze-thaw are not aging effects requiring management for WF3 SCV structure's base foundation concrete. Therefore, loss of material and cracking due to freeze-thaw are not aging effects requiring management for the WF3 SCV concrete base foundation.

3.5.2.2.1.8 Cracking due to Expansion from Reaction with Aggregate

The WF3 containment is a low-leakage free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and an ellipsoidal bottom liner plate encased in concrete. The WF3 SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS that is founded on a compacted shell filter blanket, which is supported by the Pleistocene sediments. The portion of WF3's containment that is classified as Class CC equivalent is the common concrete foundation with the shield building. Since the Class CC equivalent concrete foundation slab is inaccessible, it is exempted from examination in accordance with IWL-1220(b). Based on ongoing industry operating experience, the Structures Monitoring Program manages cracking due to expansion from reaction with aggregate in accessible concrete areas for the WF3 SCV concrete base foundation. However, the listed aging effects will be addressed under the concrete foundation for the safety-related shield building and the common rigid reinforced concrete foundation structure for the NPIS and further discussed in Section 3.5.2.2.2.1 Item 2.

3.5.2.2.1.9 Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide and Carbonation

The WF3 containment is a low-leakage free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome and an ellipsoidal bottom liner plate encased in concrete. The WF3 SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS that is founded on a compacted shell filter blanket, which is supported by the Pleistocene sediments. The portion of WF3's containment that is classified as Class CC equivalent is the common concrete foundation with the shield building. Since the Class CC equivalent concrete foundation slab is inaccessible, it is exempted from examination in accordance with IWL-1220(b). However, the listed aging effects will be addressed under the concrete foundation for the safety-related shield building and the common rigid reinforced concrete foundation structure for the NPIS and further discussed in Section 3.5.2.2.2.1 Item 4.

Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation are not aging effects requiring management for the WF3 SCV concrete base foundation.

3.5.2.2.2 Safety-Related and Other Structures and Component Supports

Structure groups and component support groups as used in the following discussions are defined in NUREG-1800, Section 3.5.1.

3.5.2.2.2.1 Aging Management of Inaccessible Areas

1. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-Thaw in Below Grade Inaccessible Concrete Areas of Groups 1–3, 5 and 7–9 Structures

   The Groups 1–3, 5 and 7–9 Structures at WF3 subject to the air-outdoor environment are not exposed to temperatures of 32°F or less of sufficient durations that would cause freeze-thaw aging effects to occur. WF3 is located in a “Negligible” weathering region per Figure 1 of ASTM C33-90. Also, air entraining admixture was used in concrete and total air content including that due to use of chemical admixtures generally ranged between 3.5 and 6.5 percent by volume. A review of the WF3 corrective action program was conducted to determine whether inspection activities identified evidence of cracking or spalling due to freeze-thaw degradation. This review found no documented conditions of freeze-thaw degradation in exterior concrete structures exposed to an air-outdoor environment.

   As a result, loss of material and cracking due to freeze-thaw in below-grade inaccessible concrete areas of Groups 1–3, 5 and 7–9 structures are not aging effects requiring management for WF3. Therefore, loss of material and cracking due to freeze-thaw are not aging effects requiring management for the below-grade inaccessible concrete areas of WF3 Groups 1–3, 5 and 7–9 structures.

2. Cracking Due to Expansion and Reaction with Aggregates in Below Grade Inaccessible Concrete Areas for Groups 1–5 and 7–9 Structures

   The Groups 1–5 and 7–9 Structures at WF3 are designed in accordance with ACI 318-63 and/or ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63 and ACI 318-71 using ingredients/materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II. Concrete aggregates conform to the requirements of ASTM C33. Materials for concrete used in WF3 concrete structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. Nevertheless, based on ongoing industry operating experience, cracking due to expansion and reaction with aggregates in below-grade inaccessible concrete areas for WF3 Groups 1–5 and 7–9 structures will be managed. WF3 has not identified operating experience for this aging effect; however, WF3 has conservatively elected to manage this aging effect by the Structures Monitoring Program.

3. Cracking and Distortion due to Increased Stress Levels from Settlement for Below Grade Inaccessible Concrete Areas of Structures for all Groups and Reduction in Foundation Strength, and Cracking, due to Differential Settlement and Erosion of Porous Concrete Subfoundation in Below Grade Inaccessible Concrete Areas for Groups 1–3, 5–9 Structures

   The Groups 1–3 and 5–9 Structures at WF3 are founded on a compacted backfill. For the inaccessible concrete areas of Groups 1–3 and 5–9 Structures at WF3 the safety-related nuclear plant island structures' (NPIS) foundations (basemat) are integral and are founded on a common rigid reinforced concrete foundation structure for the NPIS that is founded on a compacted shell filter blanket, which is supported by the Pleistocene sediments. The aging effect cracking and distortion due to increased stress levels from settlement is applicable and will be managed by the Structures Monitoring Program. For the WF3 turbine building and other nonsafety-related concrete structures which are founded on compacted structural backfill or soil, the aging effect cracking and distortion due to increased stress levels from settlement is applicable and will be managed by the Structures Monitoring Program. Therefore, cracking and distortion due to increased stress levels from settlement is an applicable aging effect for WF3 Groups 1–3 and 5–9 below-grade inaccessible concrete structures, and for the turbine building and other nonsafety-related concrete structures and will be managed by the Structures Monitoring Program.

   The Groups 1–3 and 5–9 Structures at WF3 do not rely on a dewatering system for control of settlement. The WF3 Groups 1–3 and 5–9 concrete structures do not use porous concrete subfoundations. Therefore, reduction of foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundations is not an applicable aging effect for WF3 Groups 1–3 and 5–9 below-grade inaccessible concrete structures. Additionally, the WF3 site configuration does not have Group 6 Structures. Therefore, reduction of foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundations in below-grade inaccessible concrete areas is not applicable for WF3 Group 6 structures.

4. Increase in Porosity and Permeability, and Loss of Strength Due to Leaching of Calcium Hydroxide and Carbonation of Below-grade Inaccessible Concrete Areas of Groups 1–5 and 7–9 Structures

   The Groups 1–5 and 7–9 Structures at WF3 are designed in accordance with ACI 318-63 and/or ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63 and ACI 318-71 using ingredients/materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II. Concrete aggregates conform to the requirements of ASTM C33. Materials for concrete used in WF3 concrete structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. The type and size of aggregate, slump, cement and additives have been established to produce durable concrete in accordance with ACI. 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 that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. The below-grade inaccessible concrete areas of Groups 1–5 and 7–9 concrete structures at WF3 are exposed to groundwater which is considered equivalent to a flowing water environment.

   Therefore, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas is an applicable aging effect for the inaccessible concrete of WF3 Groups 1–5 and 7–9 concrete structures. The Structures Monitoring Program manages increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas of WF3 Groups 1–5 and 7–9 concrete structures.

3.5.2.2.2.2 Reduction of Strength and Modulus of Concrete Structures due to Elevated Temperature

ACI 349 specifies concrete temperature limits for normal operations or any other long-term period. During normal operation, areas within the Group 1–5 structures at WF3 are maintained below a bulk average temperature of 150ºF by plant cooling systems. Process piping carrying hot fluid (pipe temperature greater than 200ºF) routed through penetrations in the concrete walls by design do not result in temperatures exceeding 200ºF locally or result in “hot spot” on the concrete surface. The penetration configuration includes guard pipes and insulation of the process piping to minimize heat transfer from the process pipe to the exterior environment surrounding the process piping. Therefore, change in material properties due to elevated temperature is not an aging effect requiring management for WF3 Group 1–5 Structures. The aging effect “change in material properties" is equivalent to the NUREG-1801 aging effect "reduction of strength and modulus."

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

1. Loss of Material (Spalling, Scaling) and Cracking Due to Freeze-thaw in Below-grade Inaccessible Concrete Areas of Group 6 Structures.

   The WF3 site configuration does not have Group 6 Structures. Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas is not applicable.

2. Cracking Due to Expansion and Reaction with Aggregates in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   The WF3 site configuration does not have Group 6 Structures. Therefore, cracking due to expansion and reaction in below-grade inaccessible concrete areas is not applicable.

3. Increase in Porosity and Permeability and Loss of Strength due to Leaching of Calcium Hydroxide and Carbonation in Inaccessible Areas of Concrete Elements of Group 6 Structures

   The WF3 site configuration does not have Group 6 Structures. Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas is not applicable.

3.5.2.2.2.4 Cracking due to Stress Corrosion Cracking and Loss of Material due to Pitting and Crevice Corrosion

NUREG-1800 Section 3.5.2.2.2.4 applies to stainless steel liners for concrete or steel tanks. No tanks with stainless steel liners are included in the structural scope of license renewal. However, the corresponding NUREG-1801 items can be compared to the stainless steel liners of other components, such as reactor cavity and containment sump. These liners can be exposed to a fluid environment and may be subject to loss of material. The stainless steel liners, exposed to fluid environment, are not in an environment conducive to stress corrosion cracking (SCC). Consistent with GALL Report Chapter IX, Sections D and F, the factors necessary to initiate and propagate SCC are combined actions of stress (both applied and residual tensile stresses), and harsh environment (significant presence of halogens, specifically chlorides), at temperature above 140°F (60°C). Although SCC has been observed in stagnant, oxygenated borated water systems at lower temperatures than this 140°F threshold, all of these instances have identified a significant presence of contaminants (halogens, specifically chlorides) in the failed components. SCC of stainless steel liners is not credible because they are not exposed to a harsh environment (significant presence of contaminants [halogens, specifically chlorides]), and the normal operating temperature of the fluid environment to which these stainless steel liners are exposed is less than the SCC threshold temperature of 140°F. Therefore, cracking due to SCC is not an aging effect requiring management for the stainless steel liners exposed to fluid environment. The Structures Monitoring Program manages loss of material by periodic inspections.

3.5.2.2.2.5 Cumulative Fatigue Damage due to Fatigue

TLAAs are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4 of this application. During the process of identifying TLAAs in the WF3 current licensing basis, no fatigue analyses were identified for component support members, welds, and support anchorage to building structure for Groups B1.1, B1.2, and B1.3.

3.5.2.2.3 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of WF3 quality assurance procedures and administrative controls for aging management programs.

3.5.2.2.4 Ongoing Review of Operating Experience

See Appendix B Section B.0.4 for discussion of WF3 operating experience review of aging management programs.

3.5.2.3 Time-Limited Aging Analysis

Potential TLAAs identified for structural components and commodities include fatigue analyses for crane rails and structural girders, expansion bellows and refueling bellows assembly, and steel containment vessel penetrations. TLAAs are discussed in Section 4.

3.5.3 Conclusion

The structural components and commodities subject to aging management review have been identified in accordance with the criteria of 10 CFR 54.21. The aging management programs selected to manage the effects of aging on structural components and commodities are identified in Section 3.5.2.1 and the following tables. A description of the 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 and commodities will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.5.1
Summary of Aging Management Programs for Containments, Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
PWR Concrete (Reinforced and Prestressed) and Steel Containments, BWR Concrete and Steel (Mark I, II, and III) Containments					
3.5.1-1	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete elements, all	Cracking and distortion due to increased stress levels from settlement	ISI (IWL) or Structures Monitoring Program If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Waterford 3 (WF3) does not rely on a de-watering system to control settlement. The WF3 containment system does not utilize a concrete containment. The WF3 primary containment is a free-standing steel containment vessel (SCV) which is completely enclosed by the reinforced concrete shield building. The WF3 SCV structure's base foundation is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the nuclear plant island structure (NPIS). Since the WF3 primary containment concrete foundation (basemat) is inaccessible, it is exempted from inspection and ISI-IWL program does not apply. For further evaluation, see Section 3.5.2.2.1.1.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-2	Concrete; foundation; subfoundation	Reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundation	Structures Monitoring Program. If a de-watering system is relied upon for control of erosion, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	WF3 does not have a porous concrete subfoundation or rely on a de-watering system to control settlement. The WF3 SCV structure's base foundation is integral with the base foundation of the shield building and is founded on a common rigid reinforced concrete foundation structure for the NPIS. Therefore, the listed aging effects are not applicable to WF3 primary containment foundation. For further evaluation, see Section 3.5.2.2.1.1.
3.5.1-3	Concrete: dome; wall; basemat; ring girders; buttresses, Concrete: containment; wall; basemat, Concrete: basemat, concrete fill-in annulus	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded	The concrete foundation (basemat) of the WF3 primary containment is not exposed to general and local temperatures that exceed the thresholds. Therefore the listed aging effects are not applicable to the concrete foundation (basemat) of the WF3 primary containment. For further evaluation, see Section 3.5.2.2.1.2.
3.5.1-4	BWR only				

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-5	Steel elements (inaccessible areas): liner; liner anchors; integral attachments, Steel elements (inaccessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, if corrosion is indicated from the IWE examinations.	Consistent with NUREG 1801. The Containment Inservice Inspection – IWE and the Containment Leak Rate Programs manage the loss of material of the inaccessible interior and the exterior surfaces of the Class MC components of the SCV. For further evaluation, see Section 3.5.2.2.1.3 Item 1.
3.5.1-6	BWR only				
3.5.1-7	BWR only				
3.5.1-8	Prestressing system; tendons	Loss of prestress due to relaxation, shrinkage, creep; elevated temperature	Yes, TLAA	Yes, TLAA	WF3 is a PWR with SCV consisting of a cylindrical wall, a hemispherical dome, and an ellipsoidal bottom encased in reinforced concrete supported on a common rigid reinforced concrete foundation structure for the NPIS. There are no prestressed tendons associated with WF3 primary containment design. For further evaluation, see Section 3.5.2.2.1.4.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-9	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell; unbraced downcomers, Steel elements: vent header; downcomers	Cumulative fatigue damage due to fatigue (only if [current licensing basis] CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA	Consistent with NUREG-1801 for containment penetrations that experience significant cyclic loading. Fatigue analysis for penetration bellows is a TLAA and evaluated in Section 4. For further evaluation, see Section 3.5.2.2.1.5.
3.5.1-10	Penetration sleeves, penetration bellows	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, detection of aging effects is to be evaluated	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE and Containment Leak Rate Programs manage the listed aging effect. For further evaluation see Section 3.5.2.2.1.6.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-11	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is needed for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557).	Yes, for plants located in moderate to severe weathering conditions	WF3 is a PWR with free-standing SCV supported on a common rigid reinforced concrete foundation structure for the NPIS. The SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and protected from the external environments by the shield building's base foundation. Also WF3 is located in a "Negligible" weathering region per Figure 1 of ASTM C33-90. Therefore, the concrete elements of the SCV foundation (basemat) are not subject to the listed aging effects due to freeze-thaw. For further evaluation, see Section 3.5.2.2.1.7.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-12	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): containment; wall; basemat, Concrete (inaccessible areas): basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated function	WF3 is a PWR with free-standing SCV supported on a common rigid reinforced concrete foundation structure for the NPIS. The SCV structure's base foundation (basemat) is integral with the base foundation of the shield building. The listed aging effect for concrete elements of the SCV foundation (basemat) is addressed by Item 3.5.1-43. For further evaluation, see Section 3.5.2.2.1.8.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-13	Concrete (inaccessible areas): basemat, Concrete (inaccessible areas): dome; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	WF3 is a PWR with free-standing SCV supported on a common rigid reinforced concrete foundation structure for the NPIS. The SCV structure's base foundation (basemat) is integral with the base foundation of the shield building and protected from the external environments by the shield building's base foundation. Since the WF3 primary containment concrete foundation (basemat) is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Accordingly, WF3 does not have an ISI-IWL program. The listed aging effects are addressed by Item 3.5.1-47. For further evaluation, see Section 3.5.2.2.1.9.
3.5.1-14	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	NUREG-1801 items referencing this Item Number are associated with PWR concrete containment structures, and WF3 is a steel containment structure. For further evaluation, see Section 3.5.2.2.1.9.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-15	Concrete (accessible areas): basemat.	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	ISI (IWL).	No	WF3 has an SCV and does not have an accessible concrete (basemat). The WF3 containment concrete is the circular concrete base foundation (basemat) of the SCV which is integral with the shield building concrete foundation (basemat). The SCV concrete basemat is below the base liner plate of the SCV and, therefore, is not accessible. Since concrete in this area is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Accordingly, WF3 does not have an ISI-IWL program. Therefore the listed aging effects are not applicable to WF3.
3.5.1-16	Concrete (accessible areas): basemat, Concrete: containment; wall; basemat	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	ISI (IWL) or Structures Monitoring Program	No	WF3 has an SCV and does not have accessible concrete (basemat). The WF3 containment concrete is the circular concrete base foundation (basemat) of the SCV which is integral with the shield building concrete foundation (basemat). The SCV concrete basemat is below the base liner plate of the SCV and, therefore, is not accessible. Since concrete in this area is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Therefore the listed aging effects are not applicable to WF3.
3.5.1-17	BWR only.				

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-18	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat	Loss of material (spalling, scaling) and cracking due to freeze-thaw	ISI (IWL)	No	WF3 has an SCV and does not have an accessible concrete (basemat). The WF3 containment concrete is the circular concrete base foundation (basemat) of the SCV which is integral with the shield building concrete foundation (basemat). The SCV concrete basemat is below the base liner plate of the SCV and, therefore, is not accessible. Since concrete in this area is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Therefore, the listed aging effects are not applicable to WF3.
3.5.1-19	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): basemat, Concrete (accessible areas) containment; wall; basemat, concrete fill-in annulus	Cracking due to expansion from reaction with aggregates	ISI (IWL)	No	WF3 has an SCV and does not have an accessible concrete (basemat). The WF3 containment concrete is the circular concrete base foundation (basemat) of the SCV which is integral with the shield building concrete foundation (basemat). The SCV concrete basemat is below the base liner plate of the SCV and, therefore, is not accessible. Since concrete in this area is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Therefore, the listed aging effect is not applicable to WF3.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-20	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (accessible areas): containment; wall; basemat	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	ISI (IWL)	No	NUREG-1801 items referencing this Item Number are associated with PWR concrete containment structures and WF3 has a steel containment structure. Therefore this aging effect is not applicable to WF3.
3.5.1-21	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel, Concrete (accessible areas): basemat; reinforcing steel, Concrete (accessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	ISI (IWL)	No	WF3 has an SCV and does not have an accessible concrete (basemat). The WF3 containment concrete is the circular concrete base foundation (basemat) of the SCV which is integral with the shield building concrete foundation (basemat). The SCV concrete basemat is below the base liner plate of the SCV and, therefore, is not accessible. Since concrete in this area is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. Therefore, the listed aging effect is not applicable to WF3.
3.5.1-22	BWR only.				

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-23	Concrete (inaccessible areas): basemat; reinforcing steel, Concrete (inaccessible areas): dome; wall; basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	ISI (IWL) or Structures Monitoring Program	No	WF3 is a PWR with free-standing SCV supported on a common rigid reinforced concrete foundation structure for the NPIS. The SCV structure's base foundation (basemat) is integral with the base foundation of the shield building. Since the WF3 primary containment concrete foundation (basemat) is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. The listed aging effects are addressed by Item 3.5.1-66.
3.5.1-24	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses, Concrete (inaccessible areas): basemat, Concrete (accessible areas): dome; wall; basemat	Increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack	ISI (IWL) or Structures Monitoring Program	No	NUREG-1801 items referencing this Item are not associated with the WF3 steel containment structure. WF3 is a PWR with free-standing SCV supported on a common rigid reinforced concrete foundation structure for the NPIS. The SCV structure's base foundation (basemat) is integral with the base foundation of the shield building. Since the WF3 primary containment concrete foundation (basemat) is inaccessible, it is exempted from inspection and the ISI-IWL program does not apply. The listed aging effects are addressed by Item 3.5.1-67.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-25	Concrete (inaccessible areas): dome; wall; basemat; ring girders; buttresses; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	ISI (IWL) or Structures Monitoring Program	No	NUREG-1801 items referencing this item are associated with PWR concrete containment structures and WF3 has an SCV. Therefore, this aging effect is not applicable to WF3.
3.5.1-26	Moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	ISI (IWE)	No	Consistent with NUREG 1801. The Containment Inservice Inspection – IWE manages the listed aging effect.
3.5.1-27	Penetration sleeves; penetration bellows, Steel elements: torus; vent line; vent header; vent line bellows; downcomers, Suppression pool shell	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	WF3 is a PWR with a free-standing SCV that does not have a CLB fatigue analysis. However, WF3 does have a CLB fatigue analysis for penetration bellows, which is evaluated in Section 4.6.
3.5.1-28	Personnel airlock, equipment hatch, CRD hatch	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE and Containment Leak Rate Programs manage the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-29	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear of locks, hinges and closure mechanisms	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE and Containment Leak Rate Programs manage the listed aging effect.
3.5.1-30	Pressure-retaining bolting	Loss of preload due to self-loosening	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE and Containment Leak Rate Programs manage the listed aging effect.
3.5.1-31	Pressure-retaining bolting, Steel elements: downcomer pipes	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE)	No	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE Program manages the pressure-retaining bolting aging effect. The steel elements: downcomer pipes are associated with BWR Mark I and Mark II containments. WF3 is a PWR.
3.5.1-32	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	ISI (IWL)	No	NUREG-1801 items referencing this item are associated with concrete containments and applicable to PWR and BWR prestressed concrete containments. WF3 is a PWR with free-standing SCV. There are no prestressed tendons associated with WF3 primary containment design. Therefore this aging effect is not applicable to WF3.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-33	Seals and gaskets	Loss of sealing due to wear, damage, erosion, tear, surface cracks, or other defects	10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. The Containment Leak Rate Program manages the listed aging effect.
3.5.1-34	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage	Protective Coating Monitoring and Maintenance Program	No	Consistent with NUREG 1801. The Protective Coating Monitoring and Maintenance Program manages the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-35	Steel elements (accessible areas): liner; liner anchors; integral attachments, Penetration sleeves, Steel elements (accessible areas): drywell shell; drywell head; drywell shell in sand pocket regions; Steel elements (accessible areas): suppression chamber; drywell; drywell head; embedded shell; region shielded by diaphragm floor (as applicable), Steel elements (accessible areas): drywell shell; drywell head	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE and Containment Leak Rate Programs manage the listed aging effect. WF3 is a PWR with free-standing SCV and it does not contain a drywell and components associated with sand pocket region.
3.5.1-36	BWR only.				
3.5.1-37	BWR only.				
3.5.1-38	BWR only.				
3.5.1-39	BWR only.				

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-40	BWR only.				
3.5.1-41	BWR only.				
Safety-Related and Other Structures; and Component Supports					
3.5.1-42	Groups 1-3, 5, 7-9: Concrete (inaccessible areas): foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions	WF3 is located in a region where weathering conditions are considered negligible as shown in ASTM C33-90, Fig. 1. Therefore, the concrete elements are not subject to listed aging effects due to freeze-thaw. For further discussion, see Section 3.5.2.2.2.1 Item 1.
3.5.1-43	All Groups except Group 6: Concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect. For further evaluation, see Section 3.5.2.2.2.1 Item 2.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-44	All Groups: concrete: all	Cracking and distortion due to increased stress levels from settlement	Structures Monitoring Program If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect. WF3 does not rely on a de-watering system to control settlement. For further evaluation, see Section 3.5.2.2.2.1 Item 3.
3.5.1-45	BWR only.				
3.5.1-46	Groups 1-3, 5-9: concrete: foundation; subfoundation	Reduction in foundation strength, cracking due to differential settlement, erosion of porous concrete subfoundation	Structures Monitoring Program If a de-watering system is relied upon for control of settlement, then the licensee is to ensure proper functioning of the de-watering system through the period of extended operation.	Yes, if a de-watering system is relied upon to control settlement	WF3 does not rely on a de-watering system to control settlement and it does not have porous concrete subfoundation. Therefore, the listed aging effects are not applicable to WF3 foundation; subfoundation. For further evaluation, see Section 3.5.2.2.2.1 Item 3.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-47	Groups 1-5, 7-9: concrete (inaccessible areas): exterior above and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect. For further evaluation, see Section 3.5.2.2.2.1 Item 4.
3.5.1-48	Group 1-5: concrete: all	Reduction of strength and modulus due to elevated temperature (>150°F general; >200°F local)	A plant-specific aging management program is to be evaluated.	Yes, if temperature limits are exceeded	WF3 concrete in areas for this grouping are not exposed to general and local temperatures that exceed the listed thresholds. Therefore the listed aging effect is not applicable to WF3 structures in this group. For further evaluation, see Section 3.5.2.2.2.2.
3.5.1-49	Groups 6 – concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Further evaluation is required for plants that are located in moderate to severe weathering conditions (weathering index >100 day-inch/yr) (NUREG-1557)	Yes, for plants located in moderate to severe weathering conditions	WF3 has not identified components for this grouping. Therefore this line item was not used. For further evaluation, see Section 3.5.2.2.2.3 Item 1.
3.5.1-50	Groups 6: concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated	WF3 has not identified components for this grouping. Therefore this line item was not used. For further evaluation, see Section 3.5.2.2.2.3 Item 2.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-51	Groups 6: concrete (inaccessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if leaching is observed in accessible areas that impact intended function	WF3 has not identified components for this grouping. Therefore this line item was not used. For further evaluation, see Section 3.5.2.2.2.3 Item3.
3.5.1-52	Groups 7, 8 – steel components: tank liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	A plant-specific aging management program is to be evaluated.	Yes, plant-specific	Consistent with NUREG-1801. The Structures Monitoring Program manages loss of material for this group of components. Cracking due to stress corrosion is not an aging effect requiring management for an environment of water-standing < 140°F (< 60°C). There are no stainless steel tank liners with intended functions exposed to an environment of water-standing > 140°F (> 60°C). For further evaluation, see Section 3.5.2.2.2.4.
3.5.1-53	Support members; welds; bolted connections; support anchorage to building structure	Cumulative fatigue damage due to fatigue (Only if CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA	No CLB fatigue analysis exists for component supports members, welds, and support anchorage to building structure. For further evaluation, see Section 3.5.2.2.2.5.
3.5.1-54	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-55	Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	Reduction in concrete anchor capacity due to local concrete degradation/ service induced cracking or other concrete aging mechanisms	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.
3.5.1-56	Concrete: exterior above- and below-grade; foundation; interior slab	Loss of material due to abrasion; cavitation	Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	This NUREG 1801 line item is specific to Group 6 components. WF3 has not identified components for this grouping. Therefore this line item was not used.
3.5.1-57	Constant and variable load spring hangers; guides; stops	Loss of mechanical function due to corrosion, distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads	ISI (IWF)	No	Consistent with NUREG-1801. The ISI-IWF Program manages the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-58	Earthen water-control structures: dams; embankments; reservoirs; channels; canals and ponds	Loss of material; loss of form due to erosion, settlement, sedimentation, frost action, waves, currents, surface runoff, seepage	Regulatory Guide 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	This NUREG 1801 line item is specific to Group 6 components. WF3 has not identified components for this grouping. Therefore, this line item was not used.
3.5.1-59	Group 6: concrete (accessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Regulatory Guide 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	WF3 has not identified components for this grouping. Therefore, this line item was not used.
3.5.1-60	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Regulatory Guide 1.127, “Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	WF3 has not identified components for this grouping. Therefore, this line item was not used.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-61	Group 6: concrete (accessible areas): exterior above- and below-grade; foundation; interior slab	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	WF3 has not identified components for this grouping. Therefore, this line item was not used.
3.5.1-62	Group 6: Wooden Piles; sheeting	Loss of material; change in material properties due to weathering, chemical degradation, and insect infestation repeated wetting and drying, fungal decay	Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants" or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	WF3 Structures Monitoring Program manages the listed aging effects for the wooden piles associated with fire pump house.
3.5.1-63	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above and below-grade; foundation	Increase in porosity and permeability; loss of strength due to leaching of calcium hydroxide and carbonation	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-64	Groups 1-3, 5, 7-9: concrete (accessible areas): exterior above and below-grade; foundation	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Structures Monitoring Program	No	WF3 is located in a region where weathering conditions are considered negligible as shown in ASTM C33-90, Fig. 1. Therefore, the concrete elements associated with these groups are not subject to the listed aging effects due to freeze-thaw.
3.5.1-65	Groups 1-3, 5, 7-9: concrete (inaccessible areas): below-grade exterior; foundation, Groups 1-3, 5, 7-9: concrete (accessible areas): below-grade exterior; foundation, Groups 6: concrete (inaccessible areas): all	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	No	The Structures Monitoring Program manages the listed aging effects for listed groups except for Group 6. WF3 has not identified components for Group 6; therefore, it is not applicable.
3.5.1-66	Groups 1-5, 7, 9: concrete (accessible areas): interior and above-grade exterior	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effects.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-67	Groups 1-5, 7, 9: Concrete: interior; above-grade exterior, Groups 1-3, 5, 7-9 -concrete (inaccessible areas): below-grade exterior; foundation, Group 6: concrete (inaccessible areas): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	No	The Structures Monitoring Program manages the listed aging effects for listed groups except for Group 6. WF3 has not identified components for Group 6, therefore it is not applicable.
3.5.1-68	High-strength structural bolting	Cracking due to stress corrosion cracking	ISI (IWF)	No	NUREG-1801 item referencing this item defines the bolting susceptible to SCC as: high strength (actual measured yield strength greater than or equal to 150 kilo-pound per square inch [ksi] or greater than or equal to 1,034 MPa) for structural bolts greater than 1 inch (25 mm) in diameter. Per EPRI 1015078, 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 WF3, for structural bolting applications, SCC of high strength structural bolting is not an aging effect requiring management at WF3.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-69	High-strength structural bolting	Cracking due to stress corrosion cracking	Structures Monitoring Program Note: ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. SCC potential need not be evaluated for these bolts.	No	As defined in this line item, ASTM A 325, F 1852, and ASTM A 490 bolts used in civil structures have not shown to be prone to SCC. WF3 procedures do not identify the use of high strength bolts ASTM A325 and A-490 for structural applications. Therefore, the listed aging effect is not applicable for WF3 high strength bolting.
3.5.1-70	Masonry walls: all	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall Program	No	Consistent with NUREG-1801. The Masonry Wall Program manages the listed aging effect.
3.5.1-71	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Masonry Wall Program	No	WF3 is located in a region where weathering conditions are considered negligible as shown in ASTM C33-90, Fig. 1. Therefore, the masonry walls associated with this line item are not subject to the listed aging effects due to freeze-thaw.
3.5.1-72	Seals; gasket; moisture barriers (caulking, flashing, and other sealants)	Loss of sealing due to deterioration of seals, gaskets, and moisture barriers (caulking, flashing, and other sealants)	Structures Monitoring Program	No	Consistent with NUREG-1801, the Structures Monitoring Program manages the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-73	Service Level I coatings	Loss of coating integrity due to blistering, cracking, flaking, peeling, delamination, rusting, or physical damage	Protective Coating Monitoring and Maintenance	No	Consistent with NUREG-1801. The Protective Coating Monitoring and Maintenance Program manages the listed aging effect.
3.5.1-74	Sliding support bearings; sliding support surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	Structures Monitoring Program	No	NUREG-1801 item referencing this item is associated with Lubrite plates. Lubrite plates are not subject to aging management because the listed aging mechanisms are event driven and typically can be avoided though proper design.
3.5.1-75	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	ISI (IWF)	No	NUREG-1801 item referencing this item is associated with Lubrite plates. Lubrite plates are not subject to aging management because the listed aging mechanisms are event driven and typically can be avoided though proper design. Loss of material which could cause loss of mechanical function is addressed under Item 3.5.1-77 related to component support members.
3.5.1-76	Sliding surfaces: radial beam seats in BWR drywell	Loss of mechanical function due to corrosion, distortion, dirt, overload, wear	Structures Monitoring Program	No	This NUREG-1801 item is for BWR having a drywell with radial beam seats. WF3 is a PWR with a free-standing SCV containment and does not have radial beam seats.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-77	Steel components: all structural steel	Loss of material due to corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.
3.5.1-78	Steel components: fuel pool liner	Cracking due to stress corrosion cracking; Loss of material due to pitting and crevice corrosion	Water Chemistry and Monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels.	No, unless leakages have been detected through the SFP liner that cannot be accounted for from the leak chase channels	Consistent with NUREG-1801. The Water Chemistry Control – Primary and Secondary Program and monitoring of the spent fuel pool water level manage loss of material on the spent fuel pool liner. Monitoring spent fuel pool water level in accordance with technical specifications and monitoring leakage from the leak chase channels will also continue during the period of extended operation. Cracking due to stress corrosion is not an aging effect requiring management for an environment of treated water < 140°F (< 60°C). There are no stainless steel spent fuel components with intended functions exposed to an environment of treated water > 140°F (> 60°C).
3.5.1-79	Steel components: piles	Loss of material due to corrosion	Structures Monitoring Program	No	Not applicable. WF3 has no steel piles subject to the listed aging effect; therefore this line item was not used.
3.5.1-80	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-81	Structural bolting	Loss of material due to general, pitting and crevice corrosion	ISI (IWF)	No	Consistent with NUREG-1801. The Inservice Inspection – IWF Program manages the listed aging effect.
3.5.1-82	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.
3.5.1-83	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Chapter XI.S7, “Regulatory Guide 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants” or the FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	The Structures Monitoring Program manages the listed aging effect.
3.5.1-84	Structural bolting	Loss of material due to pitting and crevice corrosion	Water Chemistry and ISI (IWF)	No	NUREG-1801 item referencing this Item Number is associated with ASME Class MC stainless steel structural bolting in a fluid environment. WF3 does not have this component/ material/environment combination. Therefore this line item was not used.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-85	Structural bolting	Loss of material due to pitting and crevice corrosion	Water Chemistry for BWR water, and ISI (IWF)	No	NUREG-1801 item referencing this Item Number is associated with ASME Class 1, 2 and 3 stainless steel structural bolting in a fluid environment for a BWR. WF3 is a PWR and does not have this component/ material/environment combination. Therefore this line item was not used.
3.5.1-86	Structural bolting	Loss of material due to pitting and crevice corrosion	ISI (IWF)	No	Consistent with NUREG-1801. The Inservice Inspection – IWF Program manages the listed aging effect.
3.5.1-87	Structural bolting	Loss of preload due to self-loosening	ISI (IWF)	No	Consistent with NUREG-1801. The Inservice Inspection – IWF Program manages the listed aging effect.
3.5.1-88	Structural bolting	Loss of preload due to self-loosening	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.
3.5.1-89	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to boric acid corrosion	Boric Acid Corrosion Program	No	Consistent with NUREG-1801. The Boric Acid Corrosion Program manages the listed aging effect.
3.5.1-90	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general (steel only), pitting, and crevice corrosion	Water Chemistry for BWR water, and ISI (IWF)	No	WF3 is a PWR with SCV. The WF3 Water Chemistry Control – Primary and Secondary and Inservice Inspection – IWF Programs manage the listed aging effect.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-91	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	ISI (IWF)	No	Consistent with NUREG-1801. The Inservice Inspection – IWF Program manages the listed aging effect.
3.5.1-92	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to general and pitting corrosion	Structures Monitoring Program	No	The Structures Monitoring and Fire Water System Programs manage the listed aging effect.
3.5.1-93	Support members; welds; bolted connections; support anchorage to building structure	Loss of material due to pitting and crevice corrosion	Structures Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.
3.5.1-94	Vibration isolation elements	Reduction or loss of isolation function due to radiation hardening, temperature, humidity, sustained vibratory loading	ISI (IWF)	No	No ISI-IWF vibration isolation elements have been identified at WF3, however for non-IWF in-scope commodities, the Structures Monitoring Program manages the listed aging effects.

Table 3.5.1: Containment, Structures and Component Supports, NUREG-1801					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-95	Aluminum, galvanized steel and stainless steel support members; welds; bolted connections; support anchorage to building structure exposed to Air – indoor, uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG 1801.

Notes for Table 3.5.2-1 through 3.5.2-4

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

501. Steel piles driven into undisturbed soils are unaffected by corrosion. Where steel piles are driven into disturbed soils, operating experience has shown that only minor to moderate corrosion has occurred that would not significantly affect the performance of the component intended function during the license renewal term. The steel piles are steel casings used as forms for the concrete inside the steel piles. The concrete inside the steel casing is not susceptible to degradation that could impair the ability of the concrete to perform its intended function. Therefore, no aging management is required.

Table 3.5.2-1
Reactor Building
Summary of Aging Management Evaluation

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Crane: rails and structural girders	HS, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.5.1-52	A
Crane – structural girders	HS, SNS	Carbon steel	Air – indoor uncontrolled	Cracking	TLAA – metal fatigue	VII.B.A-06	3.3.1-1	A
Penetration bellows	EN, HS, PB, SSR	Stainless steel	Air – indoor uncontrolled	Cracking	TLAA – metal fatigue	II.A3.C-13	3.5.1-9	A
Penetration bellows	EN, HS, PB, SSR	Stainless steel	Air – indoor uncontrolled	Cracking	CII-IWE Containment Leak Rate	II.A3.CP-38	3.5.1-10	A
Penetration sleeves	EN, HS, PB, MB, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A3.CP-36	3.5.1-35	A
Penetration sleeves	EN, HS, PB, SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Plant stack	SSR	Carbon steel	Air – indoor	Loss of material	Structures Monitoring	III.A1.TP-302	3.5.1-77	C
Steel components: annulus access lock	MB,PB, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302	3.5.1-77	C

Table 3.5.2-1: Reactor Building								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steel components: annulus access lock	FB	Carbon steel	Air – indoor uncontrolled /Air – outdoor	Loss of material	Fire Protection	VII.G.A-21 VII.G.A-22	3.3.1-59	C
Steel components: beams, columns and plates	EN, HS, MB, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Steel components: beams, columns and plates	EN, HS, MB, SNS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	C
Steel components: impingement barriers	HS, MB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Steel components: impingement barriers	HS, MB, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	C
Steel components: jib cranes	HS, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Steel components: liner plate	HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Steel components: liner plate	HS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Steel components: maintenance hatch shield door	MB, PB, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	C
Steel components: maintenance hatch shield door	FB	Carbon steel	Air – indoor uncontrolled /Air – outdoor	Loss of material	Fire Protection	VII.G.A-21 VII.G.A-22	3.3.1-59	C

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Steel components: monorails	HS, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	C
Steel components: personnel airlock, escape lock, construction hatch, maintenance hatch	EN, PB, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A3.C-16	3.5.1-28	A
Steel components: personnel airlock, escape lock, construction hatch, maintenance hatch	FB	Carbon steel	Air – indoor uncontrolled /Air – outdoor	Loss of material	Fire Protection	VII.G.A-21 VII.G.A-22	3.3.1-59	C
Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges, and closure mechanisms	PB,SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE	II.B4.CP-148	3.5.1-31	A
Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges, and closure mechanisms	PB,SSR	Carbon steel	Air – indoor uncontrolled	Loss of leak tightness	CII-IWE Containment Leak Rate	II.A3.CP-39	3.5.1-29	A

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Steel components: personnel airlock, escape lock, construction hatch; maintenance hatch: locks, hinges, and closure mechanisms	PB,SSR	Stainless steel	Air – indoor uncontrolled	Loss of leak tightness	CII-IWE Containment Leak Rate	II.A3.CP-39	3.5.1-29	A
Steel components: pressure retaining bolting	HS, PB, SSR	Carbon steel Stainless steel	Air – indoor uncontrolled	Loss of preload	CII-IWE Containment Leak Rate	II.A3.CP-150	3.5.1-30	A
Steel components: pressure retaining bolting	HS, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE	II.A3.CP-148	3.5.1-31	A
Steel component: reactor missile shield	HS, MB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	C
Steel component: reactor missile shield	HS, MB, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	C
Steel component: reactor cavity seal ring and hatches	FLB, HS, SNS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Steel component: reactor cavity seal ring and hatches	FLB, HS, SNS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Steel components: refueling maintenance structure	HS, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	C

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Steel components: refueling platform equipment assembly and rails	HS, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Steel elements (accessible areas): liner; liner anchors; integral attachments (steel containment vessel)	EN, HS, PB, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A2.CP-35	3.5.1-35	A
Steel elements (accessible areas): liner; liner anchors; integral attachments (steel containment vessel)	EN, HS, PB, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Steel elements (inaccessible areas): liner; liner anchors; integral attachments (steel containment vessel)	EN, HS, PB, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII-IWE Containment Leak Rate	II.A2.CP-98	3.5.1-5	A
Steel elements: SIS sump screens/ strainers	HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E

Table 3.5.2-1: Reactor Building								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steel elements: SIS sump screens / strainers	HS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the steam generators, pressurizer, and reactor coolant pumps)	HS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1.T-24	3.5.1-91	A
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the steam generators, pressurizer, and reactor coolant pumps)	HS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25	3.5.1-89	A

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the reactor pressure vessel)	HS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1.T-24	3.5.1-91	A
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the reactor pressure vessel)	HS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25	3.5.1-89	A
Beams, columns, floor slabs and interior walls (primary and secondary shield walls; pressurizer compartments; reactor cavity; and missile shield and barriers)	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A4.TP-28	3.5.1-67	A

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Beams, columns, floor slabs and interior walls (primary and secondary shield walls; pressurizer compartments; reactor cavity; and missile shield and barriers)	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A4.TP-26	3.5.1-66	A
Beams, columns, floor slabs and interior walls (primary and secondary shield walls; pressurizer compartments; reactor cavity; and missile shield and barriers)	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A4.TP-25	3.5.1-54	A
Concrete (accessible areas): shield building; all	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-25	3.5.1-54	A
Concrete (accessible areas): shield building; all	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A4.TP-28	3.5.1-67	A

Table 3.5.2-1: Reactor Building								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (accessible areas): shield building; all	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A4.TP-26	3.5.1-66	A
Concrete (accessible areas): refueling canal	EN, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A5.TP-25	3.5.1-54	A
Concrete (accessible areas): refueling canal	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A4.TP-28	3.5.1-67	A
Concrete (accessible areas): refueling canal	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A4.TP-26	3.5.1-66	A
Concrete (accessible areas): Shield building wall and dome; interior and above-grade exterior	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-26	3.5.1-66	A

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Concrete (accessible areas): shield building wall and dome; interior and above-grade exterior	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-28	3.5.1-67	A
Concrete (accessible areas): shield building wall and dome; interior and above-grade exterior	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-25	3.5.1-54	A
Concrete (inaccessible areas): refueling canal	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A5.TP-204	3.5.1-43	E
Concrete (inaccessible areas): shield building; all	EN, FLB, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-204	3.5.1-43	E
Compressible seals for annulus lock; escape lock; personnel lock; maintenance hatch	PB, SSR	Elastomer	Air – indoor uncontrolled	Loss of sealing	Containment Leak Rate	II.A3.CP-41	3.5.1-33	A
Containment penetration seals and sealant	FB, PB, SSR	Elastomer	Air – indoor uncontrolled	Loss of sealing,	Containment Leak Rate	II.A3.CP-41	3.5.1-33	A

Table 3.5.2-1: Reactor Building

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Inflatable seal for maintenance hatch shielding door	PB, SSR	Elastomer	Air – indoor uncontrolled	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Moisture barrier	EN, SSR	Elastomer	Air – indoor uncontrolled	Loss of sealing	CII-IWE	II.A3.CP-40	3.5.1-26	A
Service Level I coatings	SNS	Coatings	Air – indoor uncontrolled	Loss of coating integrity	Protective Coating Monitoring and Maintenance	II.A3.CP-152	3.5.1-34	A
Service Level I coatings	SNS	Coatings	Air – indoor uncontrolled	Loss of coating integrity	Protective Coating Monitoring and Maintenance	III.A4.TP-301	3.5.1-73	A

Table 3.5.2-2
Nuclear Plant Island Structure
Summary of Aging Management Evaluation

Table 3.5.2-2: Nuclear Plant Island Structure								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Control room ceiling support system	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Cooling tower fill/mist eliminators	HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A8.T-23	3.5.1-52	E
Cranes: rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Cranes: structural girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Cranes: structural girders	SNS	Carbon steel	Air – indoor uncontrolled	Cumulative fatigue damage	TLAA – metal fatigue	VII.B.A-06	3.3.1-1	A
Steel components: all structural steel	EN, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302 III.A5.TP-302	3.5.1-77	C
Steel components: all structural steel	EN, SNS, SRE, SSR	Galvanized steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-77	E
Steel components: fuel pool gate	FLB, HS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C

Table 3.5.2-2: Nuclear Plant Island Structure

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Steel components: fuel pool gate	FLB, HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – Primary and Secondary Monitoring of spent fuel storage pool level per Tech Spec and monitoring leakage from leak chase channel	III.A5.T-14	3.5.1-78	A
Steel components: fuel pool liner plate	HS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C
Steel components: fuel pool liner plate	HS, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Water Chemistry Control – Primary and Secondary Monitoring of spent fuel storage pool level per Tech Spec and monitoring leakage from leak chase channel	III.A5.T-14	3.5.1-78	A
Steel components: CSP liner plate	EN, HS, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Structures Monitoring Water Chemistry Control – Primary and Secondary	III.A7.T-23	3.5.1-52	E

Table 3.5.2-2: Nuclear Plant Island Structure

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Steel components: RWSP liner plate	EN, HS, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Structures Monitoring Water Chemistry Control – Primary and Secondary	III.A7.T-23	3.5.1-52	E
Steel components: monorails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302 III.A5.TP-302	3.5.1-77	C
Steel components: vortex breakers/ screens/strainers	EN, SSR	Stainless steel	Exposed to fluid environments	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Beams, columns, floor slabs and pipe chase	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26 III.A5.TP-26	3.5.1-66	A
Beams, columns, floor slabs and pipe chase	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A3.TP-25 III.A5.TP-25	3.5.1-54	A
Concrete (accessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled/ Air – outdoor/ Soil / Exposed to fluid environment	Cracking	Structures Monitoring	III.A3.TP-25 III.A5.TP-25	3.5.1-54	A

Table 3.5.2-2: Nuclear Plant Island Structure

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Concrete (accessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Exposed to fluid environment	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-27 III.A5.TP-27	3.5.1-65	A
Concrete (accessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability; Loss of strength	Structures Monitoring	III.A3.TP-24 III.A5.TP-24	3.5.1-63	A
Concrete (accessible areas): below-grade exterior; foundation	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-27 III.A5.TP-27	3.5.1-65	A
Concrete (accessible areas): interior and above- grade exterior	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26 III.A5.TP-26	3.5.1-66	A
Concrete (accessible areas): interior and above- grade exterior	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-28 III.A5.TP-28	3.5.1-67	A
Concrete (accessible areas): NPIS exterior above- and below-grade; foundation	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30 III.A5.TP-30	3.5.1-44	A

Table 3.5.2-2: Nuclear Plant Island Structure

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Concrete (inaccessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled/ Air – outdoor/ Soil / Exposed to fluid environment	Cracking	Structures Monitoring	III.A3.TP-204 III.A5.TP-204	3.5.1-43	E
Concrete (inaccessible areas): exterior above- and below-grade; foundation	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212 III.A5.TP-212	3.5.1-65	A
Concrete (inaccessible areas): exterior above- and below-grade; foundation	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29 III.A5.TP-29	3.5.1-67	A
Masonry walls	EN, SNS, SRE, SSR	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A3.T-12 III.A5.T-12	3.5.1-70	A
Masonry walls	FB	Concrete block	Air – indoor uncontrolled	Cracking	Structures Monitoring Fire Protection	VII.G.A-90	3.3.1-60	C
Masonry walls	FB	Concrete block	Air – indoor uncontrolled	Loss of material	Structures Monitoring Fire Protection	VII.G.A-91	3.3.1-62	C

Table 3.5.2-2: Nuclear Plant Island Structure								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Roof slabs	EN, MB, SRE, SSR	Concrete	Air – indoor uncontrolled/ Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26 III.A5.TP-26	3.5.1-66	A

Table 3.5.2-3
Turbine Building and Other Structures
Summary of Aging Management Evaluation

Table 3.5.2-3: Turbine Building and Other Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Cranes: rails and structural girders	SNS	Carbon steel	Air – indoor	Loss of material	Inspection of OVHLL			G
Steel components: all structural steel	EN, SNS, SRE	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Steel components: Metal siding	EN, SNS	Galvanized steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Steel components: Roof decking or floor decking	EN	Galvanized steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Steel components: Roof decking or floor decking	FB	Galvanized steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	C
Steel piles	SRE	Carbon Steel	Soil	None	None			I, 501
Transmission tower, angle tower, pull-off tower	SRE	Galvanized steel	Air – indoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	C
Beams, columns, floor slabs	EN, SNS, SRE	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A

Table 3.5.2-3: Turbine Building and Other Structures								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Beams, columns, floor slabs	EN, SNS, SRE	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A3.TP-25	3.5.1-54	A
Concrete (accessible areas): all	EN, SNS, SRE	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A3.TP-25	3.5.1-54	A
Concrete (accessible areas): below-grade exterior; foundation	EN, SNS, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-27	3.5.1-65	A
Concrete (accessible areas): interior and above- grade exterior	EN, SNS, SRE	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Concrete (accessible areas): interior and above- grade exterior	EN, SNS, SRE	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability; cracking; loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-28	3.5.1-67	A
Concrete (accessible areas): exterior above- and below-grade; foundation	EN, SNS, SRE	Concrete	Exposed to fluid environment	Increase in porosity and permeability; Loss of strength	Structures Monitoring	III.A3.TP-24	3.5.1-63	A
Concrete (accessible areas): exterior above- and below-grade; foundation	EN, SNS, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A

Table 3.5.2-3: Turbine Building and Other Structures								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (inaccessible areas): all	EN, SNS, SRE	Concrete	Air – indoor uncontrolled/ Air – outdoor/ Soil / Exposed to fluid environment	Cracking	Structures Monitoring	III.A3.TP-204	3.5.1-43	A
Concrete (inaccessible areas): exterior above- and below-grade; foundation	EN, SNS, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A
Concrete (inaccessible areas): exterior above- and below-grade; foundation	EN, SNS, SRE	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Duct banks	EN, SNS, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Duct banks	EN, SNS, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A

Table 3.5.2-3: Turbine Building and Other Structures

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Duct banks	EN, SNS, SRE	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A

Table 3.5.2-3: Turbine Building and Other Structures								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE	Concrete	Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-28	3.5.1-67	A
Manholes and handholes	EN, FLB, SNS, SRE	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Manholes and handholes	EN, FLB, SNS, SRE	Concrete	Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-28	3.5.1-67	A
Manholes and handholes	EN, FLB, SNS, SRE	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A
Manholes and handholes	EN, FLB, SNS, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Manholes and handholes	EN, FLB, SNS, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A

Table 3.5.2-3: Turbine Building and Other Structures								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Manholes and handholes	EN, FLB, SNS, SRE	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Manholes and handholes	FB	Concrete	Air – outdoor	Cracking, loss of material	Structures Monitoring Fire Protection	VII.G.A-92	3.3.1-61	A
Manholes and handholes	FB	Concrete	Air – outdoor	Loss of material	Structures Monitoring Fire Protection	VII.G.A-93	3.3.1-62	A
Masonry wall	EN, SNS	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A3.T-12	3.5.1-70	A
Masonry wall	FB	Concrete block	Air – indoor uncontrolled	Cracking	Structures Monitoring Fire Protection	VII.G.A-90	3.3.1-60	C
Masonry wall	FB	Concrete block	Air – indoor uncontrolled	Loss of material	Structures Monitoring Fire Protection	VII.G.A-91	3.3.1-62	C
Wooden piles	SNS	Treated wood	Soil	Loss of material Change in material properties	Structures Monitoring	III.A6.TP-223	3.5.1-62	E

Table 3.5.2-4
Bulk Commodities
Summary of Aging Management Evaluation

Table 3.5.2-4: Bulk Commodities								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Anchorage/ embedments	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Anchorage/ embedments	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C
Anchorage/ embedments	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	ISI-IWF	III.B1.1.T-24 III.B1.2.T-24	3.5.1-91	C
Anchorage/ embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Anchorage/ embedments	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Exposed to fluid environment (temp < 140)	Loss of material	Water Chemistry Control – Primary and Secondary ISI-IWF	III.B1.1.TP-10	3.5.1-90	C
Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8, III.B3.TP-8, III.B4.TP-8, III.B5.TP-8	3.5.1-95	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Anchorage/ embedments	SNS, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B2.TP-4 III.B3.TP-4 III.B4.TP-4 III.B5.TP-4	3.5.1-95	C
Cable tray	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C
Cable tray	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Cable tray	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Cable tray	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C
Cable tray	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	C
Conduit	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C
Conduit	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Conduit	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Conduit	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C
Conduit	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Constant and variable load spring hangers; guides; stops (Supports for ASME Class 1, 2 and 3 piping and components)	SRE, SSR	Carbon steel, Galvanized steel	Air – indoor uncontrolled	Loss of mechanical function	ISI-IWF	III.B1.1.T-28 III.B1.2.T-28 III.B1.3.T-28	3.5.1-57	A
Doors	EN, FLB, MB, PB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Doors	EN, FLB, MB, PB	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A5.TP-302	3.5.1-77	C
Doors	EN, FLB, MB, PB	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Fire doors	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21	3.3.1-59	A
Fire doors	SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Fire doors	SRE	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Fire hose reels	SRE	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Fire Water System	III.B2.TP-43	3.5.1-92	E

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Fire hose reels	SRE	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Fire protection components - miscellaneous steel including framing steel, curbs, vents and louvers, radiant energy shields, tray covers	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21	3.3.1-59	C
Fire protection components - miscellaneous steel including framing steel, curbs, vents and louvers, radiant energy shields, tray covers	SNS, SRE	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Manways, hatches, manhole covers and hatch covers	EN, FLB, PB, MB, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Manways, hatches, manhole covers and hatch covers	EN, FLB, PB, MB, SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Mirror insulation	SNS	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-17	3.3.1-120	C
Mirror insulation	SNS	Stainless steel	Air with borated water leakage	None	None	III.B2.TP-4	3.5.1-95	C
Missile shields	EN, MB	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A7.TP-302	3.5.1-77	C
Missile shields	EN, MB	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8 III.B5.TP-8	3.5.1-95	C
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Aluminum	Air – indoor uncontrolled	None	None	III.B2.TP-8 III.B5.TP-8	3.5.1-95	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Aluminum	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	C
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, platforms, stairs, vents and louvers, framing steel, etc)	EN, FLB, SNS, SSR	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3 III.B5.TP-3	3.5.1-89	C
Penetration seals (end caps)	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21	3.3.1-59	C
Penetration seals (end caps)	EN, FLB, PB, SNS, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Penetration seals (end caps)	EN, FLB, PB, SNS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Penetration sleeves (mechanical/ electrical not penetrating PC boundary)	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21	3.3.1-59	C
Penetration sleeves (mechanical/ electrical not penetrating PC boundary)	EN, FLB, PB, SNS, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C
Penetration sleeves (mechanical/ electrical not penetrating PC boundary)	EN, FLB, PB, SNS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B3.TP-43	3.5.1-92	C
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B3.T-25	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5.1-95	C
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B3.TP-43	3.5.1-92	C
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B3.TP-3	3.5.1-89	C
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5.1-95	C
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Stainless steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6 III.B4.TP-6	3.5.1-93	C

Table 3.5.2-4: Bulk Commodities								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B3.TP-4	3.5.1-95	C
Tube track	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C
Tube track	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.T-25	3.5.1-89	C
Tube track	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Tube track	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	A
Tube track	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C
Supports for ASME Class 1, 2 and 3 piping and components (Constant and variable load spring hangers; guides; stops)	SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25 III.B1.2.T-25	3.5.1-89	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Supports for ASME Class 1, 2 and 3 piping and components (Constant and variable load spring hangers; guides; stops)	SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.TP-3 III.B1.2.TP-3	3.5.1-89	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	ISI-IWF	III.B1.1.T-24 III.B1.2.T-24	3.5.1-91	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43 III.B3.TP-43 III.B4.TP-43 III.B5.TP-43	3.5.1-92	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25 III.B1.2.T-25 III.B2.T-25 III.B3.T-25 III.B4.T-25 III.B5.T-25	3.5.1-89	A

Table 3.5.2-4: Bulk Commodities								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	A
Support members; welds; bolted connections; support anchorage to building structure	SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	ISI-IWF	III.B1.1.T-24 III.B1.2.T-24	3.5.1-91	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.TP-3 III.B1-2.TP-3 III.B2.TP-3 III.B3.TP-3 III.B4.TP-3 III.B5.TP-3	3.5.1-89	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6 III.B4.TP-6	3.5.1-93	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B3.TP-43 III.B5.TP-43	3.5.1-92	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8 III.B3.TP-8	3.5.1-95	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Stainless steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6 III.B4.TP-6	3.5.1-93	A
Support members; welds; bolted connections; support anchorage to building structure	SNS, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B2.TP-4 III.B3.TP-4	3.5.1-95	A
Anchor bolts	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-248 III.A3.TP-248 III.A4.TP-248 III.A5.TP-248 III.A6.TP-248	3.5.1-80	A
Anchor bolts	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274	3.5.1-82	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Anchor bolts	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25 III.B1.2.T-25 III.B2.T-25 III.B3.T-25 III.B4.T-25 III.B5.T-25	3.5.1-89	C
Anchor bolts	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Anchor bolts	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Anchor bolts	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274	3.5.1-82	A
Anchor bolts	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.TP-3 III.B1-2.TP-3 III.B2.TP-3 III.B3.TP-3 III.B4.TP-3 III.B5.TP-3	3.5.1-89	C
Anchor bolts	SNS, SRE, SSR	Galvanized steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Anchor bolts	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Anchor bolts	SNS, SRE, SSR	Stainless steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6 III.B4.TP-6	3.5.1-93	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Anchor bolts	SNS, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B2.TP-4 III.B3.TP-4	3.5.1-95	C
Anchor bolts	SNS, SRE, SSR	Stainless steel	Exposed to fluid environment (Temp < 140)	Loss of material	Water Chemistry Control – Primary and Secondary ISI-IWF	III.B1.1.TP-10	3.5.1-90	C
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1.TP-226 III.B1.2.TP-226	3.5.1-81	A
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25 III.B1.2.T-25	3.5.1-89	A
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8	3.5.1-95	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	SNS, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B1.1.TP-4 III.B1.2.TP-4	3.5.1-95	A
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	SNS, SRE, SSR	Carbon steel Stainless steel	Air – indoor uncontrolled or Air with borated water leakage	Loss of preload	ISI-IWF	III.B1.1.TP-229 III.B1.2.TP-229	3.5.1-87	A
Structural bolting; Structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc)	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-248 III.A3.TP-248 III.A4.TP-248 III.A5.TP-248	3.5.1-80	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Structural bolting; Structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc)	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-302	3.5.1-82	A
Structural bolting; Structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc)	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Structural bolting; Structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc)	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Structural bolting; Structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc)	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274	3.5.1-82	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Structural bolting; Structural steel and miscellaneous steel connections, including high strength bolting (decking, grating, handrails, ladders, platforms, stairs, vents and louvers, framing steel, etc)	SNS, SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.TP-3	3.5.1-89	C
Structural bolting	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-248 III.A3.TP-248 III.A4.TP-248 III.A5.TP-248 III.B2.TP-248 III.B3.TP-248 III.B4.TP-248 III.B5.TP-248	3.5.1-80	A
Structural bolting	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1.TP-226 III.B1.2.TP-226	3.5.1-81	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Structural bolting	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274 III.B2.TP-274 III.B3.TP-274 III.B4.TP-274 III.B5.TP-274	3.5.1-82	A
Structural bolting	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Structural bolting	SRE, SSR	Carbon steel	Air – outdoor	Loss of material	ISI-IWF	III.B1.1.TP-235 III.B1.2.TP-235	3.5.1-86	A
Structural bolting	SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.T-25 III.B1.2.T-25 III.B2.T-25 III.B3.T-25 III.B4.T-25 III.B5.T-25	3.5.1-89	C
Structural bolting	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	C

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Structural bolting	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274 III.B2.TP-274 III.B3.TP-274 III.B4.TP-274 III.B5.TP-274	3.5.1-82	A
Structural bolting	SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	ISI-IWF	III.B1.1.TP-235 III.B1.2.TP-235	3.5.1-86	A
Structural bolting	SRE, SSR	Galvanized steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B1.1.TP-3 III.B1-2.TP-3 III.B2.TP-3 III.B3.TP-3 III.B4.TP-3 III.B5.TP-3	3.5.1-89	C
Structural bolting	SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B2.TP-8 III.B3.TP-8	3.5.1-95	C
Structural bolting	SNS, SRE, SSR	Stainless steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6 III.B4.TP-6	3.5.1-93	A
Structural bolting	SRE, SSR	Stainless steel	Air – outdoor	Loss of material	ISI-IWF	III.B2.TP-6	3.5.1-93	E

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Structural bolting	SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B1.1.TP-4 III.B1.2.TP-4 III.B2.TP-4 III.B3.TP-4	3.5.1-95	C
Structural bolting	SNS, SRE, SSR	Carbon steel, Stainless steel, Galvanized steel	Air – indoor uncontrolled or Air – outdoor or Air with borated water leakage	Loss of preload	Structures Monitoring	III.A1.TP-261 III.A3.TP-261 III.A4.TP-261 III.A5.TP-261 III.B2.TP-261 III.B3.TP-261 III.B4.TP-261 III.B5.TP-261	3.5.1-88	A
Structural bolting	SNS, SRE, SSR	Carbon steel, Stainless steel, Galvanized steel	Air – indoor uncontrolled or Air – outdoor or Air with borated water leakage	Loss of preload	ISI-IWF	III.B1.1.TP-229 III.B1.2.TP-229	3.5.1-87	A
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Reduction in concrete anchor capacity	Structures Monitoring	III.B1.1.TP-42 III.B1.2.TP-42 III.B2.TP-42 III.B3.TP-42 III.B4.TP-42 III.B5.TP-42	3.5.1-55	A
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A4.TP-26 III.A5.TP-26	3.5.1-66	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-28 III.A3.TP-28 III.A4.TP-28 III.A5.TP-28	3.5.1-67	A
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25	3.5.1-54	A
Curbs	FLB, SNS,SRE	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Curbs	FLB, SNS, SRE	Concrete	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-28	3.5.1-67	A
Curbs	FLB, SNS, SRE	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A3.TP-25	3.5.1-54	A
Manways, hatches, manhole covers and hatch covers	FLB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A4.TP-26 III.A5.TP-26	3.5.1-66	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Manways, hatches, manhole covers and hatch covers	FLB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-28 III.A3.TP-28 III.A4.TP-28 III.A5.TP-28	3.5.1-67	A
Manways, hatches, manhole covers and hatch covers	FLB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25	3.5.1-54	A
Manways, hatches, manhole covers and hatch covers	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A
Manways, hatches, manhole covers and hatch covers	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Manways, hatches, manhole covers and hatch covers	FB	Concrete	Air – outdoor	Cracking. loss of material	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	A
Manways, hatches, manhole covers and hatch covers	FB	Concrete	Air – outdoor	Loss of material	Fire Protection Structures Monitoring	VII.G.A-93	3.3.1-62	A
Missile shields	MB	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A7.TP-26	3.5.1-66	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Missile shields	MB	Concrete	Air – indoor uncontrolled	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A7.TP-28	3.5.1-67	A
Missile shields	MB	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A7.TP-25	3.5.1-54	A
Structural fire barriers; walls, ceilings, floor slabs, curbs, dikes	FB	Concrete	Air – indoor Uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Structural fire barriers; walls, ceilings, floor slabs, curbs, dikes	FB	Concrete	Air – indoor Uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A
Structural fire barriers; walls, ceilings, floor slabs, curbs, dikes	FB	Concrete	Air – outdoor	Cracking, loss of material	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	A
Support pedestals	SSR, SNS, SRE	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A4.TP-26 III.A5.TP-26	3.5.1-66	A

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Support pedestals	SSR, SNS, SRE	Concrete	Air – indoor uncontrolled or Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-28 III.A3.TP-28 III.A4.TP-28 III.A5.TP-28	3.5.1-67	A
Support pedestals	SSR, SNS, SRE	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25	3.5.1-54	A
Compressible joints and seals	SNS, SSR	Elastomers	Air – indoor uncontrolled or Air – outdoor	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Compressible joints and seals	SNS, SSR	Elastomers	Exposed to fluid environment	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Fire stops	FB	Cerablanket, kaowool blanket, HEMYC, Siltemp fibersil cloth, Thermo-lag, elastomers	Air – indoor uncontrolled	Loss of material, Change in material properties, Cracking/ delamination, separation	Fire Protection			J

Table 3.5.2-4: Bulk Commodities

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Fire wrap	FB	Cerablanket, Kaowool blanket, HEMYC, Siltemp fibersil cloth, Silicone elastomers, Thermo-lag, elastomers	Air – indoor uncontrolled	Loss of material, Change in material properties, Cracking/ delamination, separation	Fire Protection			J
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	SNS	Fiberglass, calcium silicate	Air – indoor uncontrolled	Loss of material, Change in material properties	Structures Monitoring			J
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	IN	Fiberglass, calcium silicate	Air – indoor uncontrolled	Reduced thermal insulation resistance	External Surfaces Monitoring	VIII.S-401	3.4.1-64	A
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	SNS	Aluminum	Air – indoor uncontrolled	None	None	VII.J.AP-36	3.3.1-113	C
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	SNS	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	SNS	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-17	3.3.1-120	C
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	IN, SNS	Stainless steel	Air with borated water leakage	None	None	III.B2.TP-4	3.5.1-95	C
Penetration seals	FB	Elastomers	Air – indoor uncontrolled	Increased hardness, shrinkage, loss of strength	Fire Protection	VII G.A-19	3.3.1-57	A
Penetration seals	EN, FLB, PB, SNS	Elastomers	Air – indoor uncontrolled or Air – outdoor	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Roof membranes	EN, SNS	Elastomers	Air – outdoor	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	C
Seals and gaskets (doors, manways and hatches)	FLB, PB, SSR	Elastomers	Air – indoor uncontrolled or Air – outdoor	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-724	A
Vibration isolators	SNS, SSR	Elastomers	Air – indoor uncontrolled	Reduction or loss of isolation function	Structures Monitoring	III.B4.TP-44	3.5.1-94	E

3.6 ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 Introduction

This section provides the results of the aging management review for WF3 electrical components which were subject to aging management review. Consistent with the methods described in NEI 95-10, the electrical and I&C aging management reviews focus on commodity groups rather than systems. As discussed in Section 2.5, the following electrical commodity groups requiring aging management review are addressed in this section.

- High-voltage insulators
- Non-EQ insulated cables and connections
  - Cable connections (metallic parts)
  - Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements
  - Electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits
  - Fuse holders (insulation material)
  - Inaccessible power (≥ 400 V) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements
- Metal-enclosed bus
- Switchyard bus and connections
- Transmission conductors and connections

Table 3.6.1, Summary of Aging Management Programs for Electrical Components Evaluated in Chapter VI of NUREG-1801, provides the summary of the aging management reviews, and the programs evaluated in NUREG-1801 for the electrical and I&C components. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.6.2 Results

Table 3.6.2-1, Electrical and I&C Components—Summary of Aging Management Evaluation, summarizes the results of aging management reviews and the NUREG-1801 comparison for electrical and I&C components.

3.6.2.1 Materials, Environments, Aging Effects Requiring Management, and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for electrical and I&C components subject to aging management review. Programs are described in Appendix B. Further details are provided in Table 3.6.2-1.

Materials

Electrical and I&C components subject to aging management review are constructed of the following materials.

- Aluminum
- Copper
- Cement
- Elastomers
- Galvanized metals (including steel)
- Insulation material – various organic polymers
- Porcelain
- Steel and steel alloys
- Stainless steel
- Various metals used for bus and electrical connections

Environments

Electrical and I&C components subject to aging management review are exposed to the following environments.

- Air – indoor controlled
- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Heat, moisture, or radiation and air
- Significant moisture

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- Change in material properties
- Increased resistance of connection
- Increased resistance of connection due to corrosion of connector contact surfaces caused by intrusion of borated water
- Loss of material
- Reduced insulation resistance (IR)

Aging Management Programs

The following aging management programs will manage the effects of aging on electrical and I&C components.

- Boric Acid Corrosion
- Metal Enclosed Bus Inspection
- Non-EQ Electrical Cable Connections
- Non-EQ Inaccessible Power Cables ($\geq$ 400 V)
- Non-EQ Insulated Cables and Connections
- Non-EQ Sensitive Instrumentation Circuits Test Review

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.6.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections, numbered corresponding to the discussions in NUREG-1800, explain the WF3 approach to these areas requiring further evaluation. Programs are described in Appendix B of this application.

3.6.2.2.1 Electrical Equipment Subject to Environmental Qualification

Electrical equipment environmental qualification (EQ) analyses may be TLAAs as defined in 10 CFR 54.3. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of EQ TLAAs are addressed in Section 4.4. EQ components are subject to replacement based on a qualified life. Therefore, in accordance with 10 CFR 54.21(a)(1)(ii), EQ components are not subject to aging management review.

3.6.2.2.2 Degradation of Insulator Quality due to Presence of Any Salt Deposits and Surface Contamination, and Loss of Material due to Mechanical Wear

The discussion in NUREG-1800 concerns effects of these aging mechanisms on high voltage insulators.

High voltage insulators are subject to aging management review if they are necessary for the alternate AC (AAC) source for SBO, or recovery of offsite power following an SBO. Other high voltage insulators are not subject to aging management review since they do not perform a license renewal intended function.

The high voltage insulators evaluated for WF3 license renewal are those used to support uninsulated, high-voltage electrical components such as transmission conductors and switchyard buses that are in the scope of license renewal.

Various airborne materials such as dust, salt and industrial effluents can contaminate insulator surfaces. The buildup of surface contamination is gradual and in most areas washed away by rain. The glazed insulator surface aids this contamination removal.

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 seacoast where salt spray is prevalent. WF3 is located near the seacoast and near other sources of airborne particles. However, salt spray buildup is a short-term concern based on local weather conditions (event-driven). Flashover due to salt contamination of insulators is caused by events, typically storms, regardless of the age of the insulators. This is clearly not an effect of aging. Surface contamination is not an applicable aging mechanism for high-voltage insulators at WF3; however, because of the significance of this event, system walkdowns are performed periodically to do a visual inspection of the switchyard high-voltage insulators that are in-scope of license renewal. Therefore, reduced insulation resistance due to surface contamination is not an applicable aging effect for high-voltage insulators at WF3.

Loss of material due to mechanical wear is a potential aging effect for strain and suspension insulators subject to movement. Although this aging effect is possible, industry experience has shown transmission conductors do not normally swing and when subjected to a substantial wind, movement will subside after a short period. Wear has not been apparent during routine inspections and is not a credible aging effect.

Wind loading could cause transmission conductor vibration or sway. Wind loading that can cause a transmission line and insulators to vibrate is considered in the design and installation of transmission conductors at WF3. Loss of material (wear) and fatigue that could be caused by transmission conductor vibration or sway are not applicable aging effects in that they would not cause a loss of intended function if left unmanaged for the period of extended operation.

There are no aging effects requiring management for WF3 high-voltage insulators.

3.6.2.2.3 Loss of Material due to Wind Induced Abrasion and Fatigue, Loss of Conductor Strength due to Corrosion, and Increased Resistance of Connection due to Oxidation or Loss of Pre-load

Transmission conductors are uninsulated, stranded electrical cables used outside buildings in high voltage applications. The transmission conductor commodity group includes the associated fastening hardware but excludes the high-voltage insulators. Major active equipment assemblies include their associated transmission conductor terminations.

Transmission conductors are subject to aging management review if they are necessary for recovery of offsite power following an SBO. At WF3, transmission conductors from the WF3 230 kV switchyard to the startup transformers (3A and 3B) support recovery from an SBO. Other transmission conductors are not subject to aging management review since they do not perform a license renewal intended function.

Switchyard bus is uninsulated, un-enclosed, rigid electrical conductors used in medium- and high-voltage applications. Switchyard bus includes the hardware used to secure the bus to high-voltage insulators. Switchyard bus establishes electrical connections to disconnect switches, switchyard breakers, and transformers.

Switchyard bus is subject to aging management review if it is necessary for recovery of offsite power following an SBO. At WF3, switchyard bus from the 230 kV switchyard breakers to the 230 kV transmission conductors support recovery from an SBO. Other switchyard bus does not require aging management review since it does not perform a license renewal intended function.

Loss of Material due to Wind Induced Abrasion and Fatigue

Wind loading could cause transmission conductor vibration or sway. Wind loading that can cause a transmission line and insulators to vibrate is considered in the design and installation of transmission conductors at WF3. Loss of material (wear) and fatigue that could be caused by transmission conductor vibration or sway are not applicable aging effects in that they would not cause a loss of intended function if left unmanaged for the period of extended operation.

Switchyard bus is connected to active equipment by short sections of flexible conductors that the rigid bus does not normally vibrate, since it is supported by insulators and ultimately by static, structural components such as concrete footings and structural steel. Vibration issues occur early in plant life and as a result of inadequate design, installation, or maintenance. The flexible conductors withstand the minor vibrations associated with the active switchyard components. Flexible conductors are part of the switchyard bus commodity group. Vibration is not applicable since flexible connectors connecting switchyard bus to active components eliminate potential for vibration.

A review of industry operating experience and NRC generic communications related to the aging of transmission conductors ensured that no additional aging effects exist beyond those previously identified. A review of plant-specific operating experience did not identify any unique aging effects for transmission conductors.

Therefore, loss of material due to wear of transmission conductors is not an aging effect requiring management at WF3.

Therefore, loss of material due to wear of switchyard bus is not an aging effect requiring management at WF3.

Loss of Conductor Strength due to Corrosion

The aging effect loss of conductor strength (corrosion) applies to aluminum conductor steel reinforced (ACSR) transmission conductors. The most prevalent mechanism contributing to loss of conductor strength of an ACSR transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For ACSR transmission conductors, degradation begins as a loss of zinc from the galvanized steel core wires.

WF3 ACSR conductors are susceptible to environmental influences, such as sulfur dioxide (SO_2) concentration in the air. When the steel core of an ACSR conductor loses its galvanized coating, it will continually corrode causing a decrease in ultimate strength.

Corrosion in ACSR conductors is a very slow acting mechanism, and the corrosion rates depend largely on air quality, which includes suspended particles chemistry, SO_2 concentration in air, precipitation, fog chemistry and meteorological conditions. Tests performed by Ontario Hydroelectric showed a 30 percent loss of composite conductor strength of an 80-year-old ACSR conductor due to corrosion. The License Renewal Electrical Handbook (LREH) makes statements relative to transmission conductor aged strengths based upon testing performed by Ontario Hydro.

This specific conductor construction type at WF3 was included in the Ontario Hydroelectric test, so the results of this test are representative of the WF3 230 kV conductors. The 336.4 thousand circular mils (MCM) 26/7 ACSR transmission conductor identified in the Ontario Hydro electric test, as documented in the companion paper, “Aged ACSR Conductors, Part II—Prediction of Remaining Life,” bounds the WF3 transmission conductors. The example presented in LREH compares a 4/0 ACSR conductor to the results of the Ontario Hydroelectric Study. The same comparison method is made here for the WF3 transmission conductors.

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 WF3 transmission conductor intended function through the period of extended operation.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60 percent 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 this AMR. The following evaluation of the conductor type with the smallest ultimate strength margin (4/0 ACSR) in the NESC illustrates the conservative nature of the design of WF3 transmission conductors required for offsite power recovery.

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 percent of ultimate strength margin. The Ontario Hydroelectric study showed a 30 percent loss of composite conductor strength in an 80-year-old conductor. In the case of the 4/0 ACSR transmission conductors, a 30 percent loss of ultimate strength would mean that there would still be a 37 percent ultimate strength margin between what is required by the NESC and the actual conductor strength. The 4/0 ACSR conductor type has the lowest initial design margin of transmission conductors included in the AMR. This illustrates with reasonable assurance that transmission conductors will have ample strength through the period of extended operation.

A review of industry operating experience and NRC generic communications related to the aging of transmission conductors ensured that no additional aging effects exist beyond those identified. A review of plant-specific operating experience did not identify any unique aging effects for transmission conductors.

Therefore, loss of conductor strength is not an aging effect requiring management for transmission conductors.

Increased Resistance of Connection due to Oxidation

Corrosion due to surface oxidation for aluminum switchyard bus and connections are not applicable since switchyard bus connections requiring AMR are welded connections. However, the flexible conductors, which are welded to the switchyard bus, are bolted to the other switchyard components. These steel and steel-alloy switchyard component connections are included in the infrared inspection of the 230 kV switchyard connections, which verifies the effectiveness of the connection design and installation practices. WF3 performs infrared inspections of the 230 kV switchyard connections and transformer yard connections to verify the integrity of the connections at least once a year. This inspection and the absence of plant-specific operating experience verifies that this aging effect is not significant for WF3.

Increased connection resistance due to surface oxidation is a potential aging mechanism, but is not significant enough to cause a loss of intended function. The aluminum, and steel alloy components in the switchyard are exposed to precipitation, but these components do not experience aging effects in this environment, except for minor oxidation, which does not affect the ability of the connections to perform their intended function. At WF3, switchyard connection surfaces are coated with an anti-oxidant compound (i.e., a grease-type sealant) prior to tightening the connection to prevent the formation of oxides on the metal surface and to prevent moisture from entering the connections thus reducing the chances of corrosion. Based on operating experience (WF3 and the industry), this method of installation provides a corrosion-resistant low electrical resistance connection. In addition, the infrared inspection of the 230 kV switchyard verifies that this aging effect is not significant for WF3. This discussion is applicable for bolted connections of transmission conductors and switchyard bus.

Therefore, increased connection resistance due to general corrosion resulting from oxidation of switchyard connection metal surfaces is not an aging effect requiring management at WF3.

Increased Resistance of Connection due to Loss of Pre-load

Increased connection resistance due to loss of pre-load (torque relaxation) for switchyard connections is not an aging effect requiring management. The LREH does not list this as an applicable aging effect. The design of the transmission conductor bolted connections precludes torque relaxation as confirmed by plant-specific operating experience. The WF3 operating experience report did not identify any failures of switchyard connections. The design of switchyard bolted connections includes Bellville washers and an anti-oxidant compound (no-ox grease). The type of bolting plate and the use of Bellville washers is the industry standard to preclude torque relaxation. This combined with the proper sizing of the conductors eliminates the need to consider this aging mechanism; therefore, increased connection resistance due to loss of pre-load is not an aging effect requiring management. This discussion is applicable for bolted connections of transmission conductors and switchyard bus.

In-scope transmission conductors at WF3 are limited to the connections from the 230 kV switchyard to Startup Transformers 3A and 3B for the off-site power recovery paths. WF3 performs infrared inspection of the 230 kV switchyard connections as part of a repetitive preventive maintenance task to verify the integrity of the connections. These routine inspections and the absence of plant-specific operating experience verifies that this aging effect is not significant for WF3.

Based on this information, increased connection resistance due to loss of pre-load of transmission conductor and switchyard bus connections is not an aging effect requiring management for WF3.

There are no applicable aging effects that could cause loss of the intended function of the transmission conductors for the period of extended operation.

There are no aging effects requiring management for WF3 transmission conductors and switchyard bus connections.

3.6.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of WF3 quality assurance procedures and administrative controls for aging management programs.

3.6.2.2.5 Ongoing Review of Operating Experience

See Appendix B Section B.0.4 for discussion of WF3 operating experience review programs.

3.6.2.3 Time-Limited Aging Analysis

The only TLAAs identified for the electrical and I&C commodity components are evaluations for environmental qualification (EQ) associated with 10 CFR 50.49. The EQ TLAAs are evaluated in Section 4.4.

3.6.3 Conclusion

Electrical and I&C components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21(a)(1). Aging management programs selected to manage aging effects for the electrical and I&C components are identified in Section 3.6.2.1 and in the following tables. A description of aging management programs is provided in Appendix B of this application, along with the demonstration that the identified aging effects will be managed for the period of extended operation.

Based on the demonstrations provided in Appendix B, the effects of aging associated with electrical and I&C components will be managed such that there is reasonable assurance the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.6.1
Summary of Aging Management Programs for the EIC Components Evaluated in Chapter VI of NUREG-1801

Table 3.6.1: EIC Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-1	Electrical equipment subject to 10 CFR 50.49 EQ requirements composed of various polymeric and metallic materials exposed to adverse localized environment caused by heat, radiation, oxygen, moisture, or voltage	Various aging effects due to various mechanisms in accordance with 10CFR 50.49	EQ is a time-limited aging analysis (TLAA) to be evaluated for the period of extended operation. See the Standard Review Plan, Section 4.4, "Environmental Qualification (EQ) of Electrical Equipment," for acceptable methods for meeting the requirements of 10 CFR 54.21(c)(1)(i) and (ii). See Chapter X.E1, "Environmental Qualification (EQ) of Electric Components," of this report for meeting the requirements of 10 CFR 54.21(c)(1)(iii).	Yes, TLAA	EQ equipment is not subject to aging management review because the equipment is subject to replacement based on a qualified life. EQ analyses are evaluated as potential TLAAs in Section 4.4. See Section 3.6.2.2.1 for further evaluation.

Table 3.6.1: EIC Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-2	High-voltage insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement exposed to air – outdoor	Loss of material due to mechanical wear caused by wind blowing on transmission conductors	A plant-specific aging management program is to be evaluated	Yes, plant specific	NUREG-1801 aging effects are not applicable to WF3. See Section 3.6.2.2.2 for further evaluation.
3.6.1-3	High-voltage insulators composed of porcelain; malleable iron; aluminum; galvanized steel; cement exposed to air – outdoor	Reduced insulation resistance due to presence of salt deposits or surface contamination	A plant-specific aging management program is to be evaluated for plants located such that the potential exists for salt deposits or surface contamination (e.g., in the vicinity of salt water bodies or industrial pollution)	Yes, plant specific	NUREG-1801 aging effects are not applicable to WF3. See Section 3.6.2.2.2 for further evaluation.
3.6.1-4	Transmission conductors composed of aluminum; steel exposed to air – outdoor	Loss of conductor strength due to corrosion	A plant-specific aging management program is to be evaluated for ACSR	Yes, plant specific	NUREG-1801 aging effects are not applicable to WF3. See Section 3.6.2.2.3 for further evaluation.
3.6.1-5	Transmission connectors composed of aluminum; steel exposed to air – outdoor	Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant specific	NUREG-1801 aging effects are not applicable to WF3. See Section 3.6.2.2.3 for further evaluation.

Table 3.6.1: EIC Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-6	Switchyard bus and connections composed of aluminum; copper; bronze; stainless steel; galvanized steel exposed to air – outdoor	Loss of material due to wind-induced abrasion; Increased resistance of connection due to oxidation or loss of pre-load	A plant-specific aging management program is to be evaluated	Yes, plant specific	NUREG-1801 aging effects are not applicable to WF3. See Section 3.6.2.2.3 for further evaluation.
3.6.1-7	Transmission conductors composed of aluminum; steel exposed to air – outdoor	Loss of material due to wind-induced abrasion	A plant-specific aging management program is to be evaluated for ACAR and ACSR	Yes, plant specific	NUREG-1801 aging effects are not applicable to WF3. See Section 3.6.2.2.3 for further evaluation.
3.6.1-8	Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Chapter XI.E1, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The Non-EQ Insulated Cables and Connections Program will manage the effects of aging. This program includes inspection of non-EQ electrical and I&C penetration cables and connections. WF3 EQ electrical and I&C penetration assemblies are covered under the EQ program.

Table 3.6.1: EIC Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-9	Insulation material for electrical cables and connections used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance (IR) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to adverse localized environment caused by heat, radiation, or moisture	Reduced insulation resistance due to thermal/ thermoxidative degradation of organics, radiolysis, and photolysis (UV sensitive materials only) of organics; radiation-induced oxidation; moisture intrusion	Chapter XI.E2, "Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits"	No	Consistent with NUREG-1801. The Non-EQ Sensitive Instrumentation Circuits Test Review Program will manage the effects of aging. This program includes review of calibration results or surveillance findings for instrumentation circuits.
3.6.1-10	Conductor insulation for inaccessible power cables greater than or equal to 400 volts (e.g., installed in conduit or direct buried) composed of various organic polymers (e.g., EPR, SR, EPDM, XLPE) exposed to adverse localized environment caused by significant moisture	Reduced insulation resistance due to moisture	Chapter XI.E3, "Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The Non-EQ Inaccessible Power Cables (≥ 400 V) Program will manage the effects of aging. This program includes inspection and testing of power cables exposed to significant moisture as required.

Table 3.6.1: EIC Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-11	Metal enclosed bus: enclosure assemblies composed of elastomers exposed to air – indoor, controlled or uncontrolled or air – outdoor	Surface cracking, crazing, scuffing, dimensional change (e.g. "ballooning" and "necking"), shrinkage, discoloration, hardening and loss of strength due to elastomer degradation	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. The Metal Enclosed Bus Inspection Program will manage the effects of aging. This program includes elastomers associated with flexible boots.
3.6.1-12	Metal enclosed bus: bus/ connections composed of various metals used for electrical bus and connections exposed to air – indoor, controlled or uncontrolled or air – outdoor	Increased resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	Chapter XI.E4, "Metal Enclosed Bus"	No	Consistent with NUREG-1801. The Metal Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of interior portions of the bus.
3.6.1-13	Metal enclosed bus: insulation; insulators composed of porcelain; xenoy; thermo-plastic organic polymers exposed to air – indoor, controlled or uncontrolled or air – outdoor	Reduced insulation resistance due to thermal/thermoxidative degradation of organics/ thermoplastics, radiation-induced oxidation, moisture/ debris intrusion, and ohmic heating	Chapter XI.E4, "Metal Enclosed Bus"	No	Consistent with NUREG-1801. The Metal Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of interior portions of the bus.

Table 3.6.1: EIC Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-14	Metal enclosed bus: external surface of enclosure assemblies composed of steel exposed to air – indoor, uncontrolled or air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Metal Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of exterior portions of the bus.
3.6.1-15	Metal enclosed bus: external surface of enclosure assemblies composed of galvanized steel; aluminum exposed to air – outdoor	Loss of material due to pitting and crevice corrosion	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. The Metal Enclosed Bus Inspection Program will manage the effects of aging. This program includes visual inspection of exterior portions of the bus.

Table 3.6.1: EIC Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-16	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air – indoor, uncontrolled	Increased resistance of connection due to chemical contamination, corrosion, and oxidation (in an air, indoor controlled environment, increased resistance of connection due to chemical contamination, corrosion and oxidation do not apply); fatigue due to ohmic heating, thermal cycling, electrical transients	Chapter XI.E5, "Fuse Holders"	No	NUREG-1801 aging effects are not applicable to WF3. A review of WF3 documentation indicated that fuse holders utilizing metallic clamps are either located in circuits that perform no license renewal intended function, or part of an active component. Therefore, fuse holders with metallic clamps at WF3 are not subject to aging management review, and do not have aging effects that require an aging management program.

Table 3.6.1: EIC Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-17	Fuse holders (not part of active equipment): metallic clamps composed of various metals used for electrical connections exposed to air – indoor, controlled or uncontrolled	Increased resistance of connection due to fatigue caused by frequent manipulation or vibration	Chapter XI.E5, "Fuse Holders" No aging management program is required for those applicants who can demonstrate these fuse holders are located in an environment that does not subject them to environmental aging mechanisms or fatigue caused by frequent manipulation or vibration	No	NUREG-1801 aging effects are not applicable to WF3. A review of WF3 documents indicated that fuse holders utilizing metallic clamps are either located in circuits that perform no license renewal intended function, or part of an active component. Therefore, fuse holders with metallic clamps at WF3 are not subject to aging management review, and do not have aging effects that require an aging management program.
3.6.1-18	Cable connections (metallic parts) composed of various metals used for electrical contacts exposed to air – indoor, controlled or uncontrolled or air – outdoor	Increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, and oxidation	Chapter XI.E6, "Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements"	No	Consistent with NUREG-1801. The one-time inspection program (Non-EQ Electrical Cable Connections) will verify the absence of aging effects requiring management.

Table 3.6.1: EIC Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-19	Connector contacts for electrical connectors exposed to borated water leakage composed of Various metals used for electrical contacts exposed to Air with borated water leakage	Increased resistance of connection due to corrosion of connector contact surfaces caused by intrusion of borated water	Chapter XI.M10, “Boric Acid Corrosion”	No	Consistent with NUREG-1801. The Boric Acid Corrosion Program will manage the effects of aging.
3.6.1-20	Transmission conductors composed of aluminum exposed to air – outdoor	Loss of conductor strength due to corrosion	None - for Aluminum Conductor Aluminum Alloy Reinforced (ACAR)	No	NUREG-1801 material and aging effects are not applicable to WF3.
3.6.1-21	Fuse holders (not part of a larger assembly): insulation material, metal enclosed bus: external surface of enclosure assemblies composed of insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate; other, galvanized steel; aluminum, steel exposed to air – indoor, controlled or uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Notes for Table 3.6.2-1

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

D. Component is different, but consistent with material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP has exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited or NUREG-1801 identifies a plant-specific aging management program.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

601. WF3 fuse holders with metallic fuse clips are either part of an active component or located in circuits that perform no license renewal intended function and thus are not subject to aging management review. Therefore, fuse holders (metallic clamp) at WF3 do not have aging effects that require an aging management program.

Table 3.6.2-1
Electrical and I&C Components
Summary of Aging Management Evaluation

Table 3.6.2-1: Electrical and I&C Components

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Cable connections (metallic parts)	CE	Various metals used for electrical connections	Air – indoor controlled or uncontrolled or Air – outdoor	Increased resistance of connection	Non-EQ Electrical Cable Connections	VI.A.LP-30 VI.A-1 (LP-12)	3.6.1-18	A
Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) not subject to 10CFR50.49 EQ requirements (includes non-EQ electrical and I&C penetration conductors and connections)	IN	Insulation material – various organic polymers	Heat, moisture, or radiation and air	Reduced insulation resistance (IR)	Non-EQ Insulated Cables and Connections	VI.A.LP-33 VI.A-2 (L-01)	3.6.1-8	A
Insulation material for electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	IN	Insulation material – various organic polymers	Heat, moisture, or radiation and air	Reduced insulation resistance (IR)	Non-EQ Sensitive Instrumentation Circuits Test Review	VI.A.LP-34 VI.A-3 (L-02)	3.6.1-9	A

Table 3.6.2-1: Electrical and I&C Components								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Fuse holders (not part of active equipment): insulation material	IN	Insulation material – various organic polymers	Air – indoor controlled or uncontrolled	None	None	VI.A.LP-24 VI.A-7 (LP-02)	3.6.1-21	A
Fuse holders (not part of active equipment): metallic clamps	CE	Various metals used for electrical connections	Air – indoor controlled or uncontrolled	None	None	VI.A.LP-31 VI.A-8 (LP-01)	3.6.1-17	I, 601
Fuse holders (not part of active equipment): metallic clamps	CE	Various metals used for electrical connections	Air – indoor controlled or uncontrolled	None	None	VI.A.LP-23 VI.A-8 (LP-01)	3.6.1-16	I, 601
High voltage insulators (high voltage insulators for SBO recovery)	IN	Porcelain, galvanized metal, cement	Air - outdoor	None	None	VI.A.LP-32 VI.A-10 (LP-11)	3.6.1-2	I
High voltage insulators (high voltage insulators for SBO recovery)	IN	Porcelain, galvanized metal, cement	Air - outdoor	None	None	VI.A.LP-28 VI.A-9 (LP-07)	3.6.1-3	I

Table 3.6.2-1: Electrical and I&C Components								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Programs**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Conductor insulation for inaccessible power cables (≥ 400 V) not subject to 10 CFR 50.49 EQ requirements	IN	Insulation material – various organic polymers; paper and oil	Significant moisture	Reduced insulation resistance (IR)	Non-EQ Inaccessible Power Cables (≥ 400 V)	VI.A.LP-35 VI.A-4 (L-03)	3.6.1-10	B
Metal enclosed bus: bus/connections	CE	Various metals used for electrical bus and connections	Air – indoor, controlled or uncontrolled or Air – outdoor	Increased connection resistance	Metal Enclosed Bus Inspection	VI.A.LP-25	3.6.1-12	A
Metal enclosed bus: enclosure assemblies	CE	Elastomers	Air – indoor, controlled or uncontrolled or Air – outdoor	Change in material properties	Metal Enclosed Bus Inspection	VI.A.LP-29	3.6.1-11	A
Metal enclosed bus: external surface of enclosure assemblies	CE	Galvanized steel; aluminum	Air – indoor, controlled or uncontrolled	None	None	VI.A.LP-41	3.6.1-21	A
Metal enclosed bus: external surface of enclosure assemblies	CE	Galvanized steel; aluminum	Air – outdoor	Loss of material	Metal Enclosed Bus Inspection	VI.A.LP-42	3.6.1-15	A
Metal enclosed bus: external surface of enclosure assemblies	CE	Steel	Air – indoor, controlled	None	None	VI.A.LP-44	3.6.1-21	A

Table 3.6.2-1: Electrical and I&C Components

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Metal enclosed bus: external surface of enclosure assemblies	CE	Steel	Air – indoor, uncontrolled or Air – outdoor	Loss of material	Metal Enclosed Bus Inspection	VI.A.LP-43	3.6.1-14	A
Metal enclosed bus: insulation; insulators	IN	Porcelain; insulation material – various organic polymers	Air – indoor, controlled or uncontrolled or Air – outdoor	Reduced insulation resistance	Metal Enclosed Bus Inspection	VI.A.LP-26	3.6.1-13	A
Switchyard bus and connections (switchyard bus for SBO recovery)	CE	Aluminum, steel, steel alloy	Air - outdoor	None	None	VI.A.LP-39 VI.A-15 (LP-9)	3.6.1-6	I
Transmission conductors (transmission conductors for SBO recovery)	CE	Aluminum	Air - outdoor	None	None	VI.A.LP-46 VI.A-16 (LP-08)	3.6.1-4	C
Transmission conductors (transmission conductors for SBO recovery)	CE	Aluminum	Air - outdoor	None	None	VI.A.LP-47 VI.A-16 (LP-08)	3.6.1-7	I

Table 3.6.2-1: Electrical and I&C Components

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Programs	NUREG-1801 Item	Table 1 Item	Notes
Transmission connectors (transmission connectors for SBO recovery)	CE	Aluminum, steel, steel alloy	Air - outdoor	None	None	VI.A.LP-48 VI.A-16 (LP-08)	3.6.1-5	I
Connector contacts for electrical connectors exposed to borated water leakage	CE	Various metals used for electrical contacts	Air with borated water leakage	Increased resistance of connection due to corrosion of connector contact surfaces caused by intrusion of borated water	Boric Acid Corrosion	VI.A.LP-36 VI.A-5 (L-04)	3.6.1-19	A

4.0 TIME-LIMITED AGING ANALYSES

This section provides the results of evaluations of time-limited aging analyses (TLAAs) and exemptions based on a TLAA. This section evaluates each identified TLAA in accordance with 10 CFR 54.21(c).

Section 4.1 provides the 10 CFR Part 54 definition of TLAAs and requirements for evaluation of TLAAs and summarizes the process used for identifying and evaluating TLAAs and exemptions.

Subsequent sections of this chapter describe the evaluation of TLAAs within the following categories.

- Section 4.2, Reactor Vessel Neutron Embrittlement
- Section 4.3, Metal Fatigue
- Section 4.4, Environmental Qualification (EQ) of Electric Equipment
- Section 4.5, Concrete Containment Tendon Prestress
- Section 4.6, Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis
- Section 4.7, Other Plant-Specific TLAAs

References for Section 4 are provided in Section 4.8.

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

Time-limited aging analyses are defined in 10 CFR 54.3.

> *Time-limited aging analyses*, for the purposes of this part, are those licensee calculations and analyses that:
>
> (1) Involve systems, structures, and components within the scope of license renewal, as delineated in § 54.4(a);
>
> (2) Consider the effects of aging;
>
> (3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;
>
> (4) Were determined to be relevant by the licensee in making a safety determination;
>
> (5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in § 54.4(b); and
>
> (6) Are contained or incorporated by reference in the CLB.

Section 10 CFR 54.21(c) requires a list of TLAAs be included in an application for a renewed license. Section 10 CFR 54.21(c)(2) requires a list of exemptions granted pursuant to 10 CFR 50.12 that are based on a TLAA to be in the application for a renewed license.

> § 54.21 Contents of application — technical information.
>
> (c) An evaluation of time-limited aging analyses.
>
> (1) A list of time-limited aging analyses, as defined in § 54.3, must be provided. The applicant shall demonstrate that—
>
> (i) The analyses remain valid for the period of extended operation;
>
> (ii) The analyses have been projected to the end of the period of extended operation; or
>
> (iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.
>
> (2) A list must be provided of plant-specific exemptions granted pursuant to 10 CFR 50.12 and in effect that are based on time-limited aging analyses as defined in § 54.3. The applicant shall provide an evaluation that justifies the continuation of these exemptions for the period of extended operation.

4.1.1 Identification of TLAAs

The process for identifying time-limited aging analyses is consistent with the guidance provided in NEI 95-10 (Ref. 4-1). Calculations and analyses that potentially meet the definition of a TLAA in 10 CFR 54.3 were identified by searching current licensing basis documents including the following.

- Final Safety Analysis Report (FSAR)
- Technical Specifications and Bases
- Technical Requirements Manual
- Facility Operating License
- Fire protection program documents
- Inservice inspection procedures
- Relevant NRC safety evaluation reports (SERs)
- Relevant Westinghouse Commercial Atomic Power reports (WCAPs)
- Docketed licensing correspondence

Industry documents that list generic TLAAs were also reviewed to provide additional assurance of the completeness of the identification of WF3 TLAAs. These documents included NEI 95-10 (Ref. 4-1); NUREG-1800 (Ref. 4-2); and EPRI Report TR-105090 (Ref. 4-4).

Table 4.1-1 provides a summary listing of the TLAAs applicable to WF3. Table 4.1-2 provides a comparison of the WF3 TLAAs to the potential TLAAs identified in NUREG-1800.

4.1.2 Identification of Exemptions

Exemptions for WF3 were identified through a review of the FSAR, the operating license, the Technical Specifications, NRC SERs, ASME Section XI Program documentation, fire protection program documents, NRC Agencywide Documents Access and Management System (ADAMS) database, and docketed correspondence. There are no exemptions that were granted in accordance with 10 CFR 50.12 that are based on a TLAA, regardless of whether the exemptions remain in effect for the period of extended operation.

Table 4.1-1
List of TLAAs

TLAA Description	Resolution Option	LRA Section
Reactor Vessel Neutron Embrittlement Analyses		4.2
Reactor vessel fluence	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.1
Upper-shelf energy	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.2
Pressurized thermal shock	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.3
Pressure-temperature limits	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.2.4
Low temperature overpressure protection (LTOP) setpoints	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.2.5
Metal Fatigue Analyses		4.3
Reactor vessel	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.1
Reactor vessel internals	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.2
Pressurizer	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.3
Steam generators	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.4
Control element drive mechanisms	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.5
Reactor coolant pumps	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.6
Reactor coolant system Class 1 piping	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.7
Non-class 1 piping and in-line components	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.3.2.1
Flexible connections and expansion joints	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.3.2.2

Table 4.1-1 (Continued)
List of TLAAs

TLAA Description	Resolution Option	LRA Section
Non-Class 1 heat exchangers with fatigue analysis	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.2.3
Effects of reactor water environment on fatigue life	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.3
Environmental Qualification of Electrical Equipment		4.4
Environmental qualification analyses of electrical equipment	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.4
Concrete Containment Tendon Prestress		4.5
Concrete containment tendon prestress analysis	None. WF3 containment does not include tendons.	4.5
Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis		4.6
Containment vessel design	No TLAA identified for containment vessel design.	4.6
Containment penetration bellows analyses	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.6
Other Plant-Specific TLAAs		4.7
Crane load cycle analysis	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.1
Leak-before-break analysis	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.7.2
Postulation of high energy line break (HELB) locations	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.7.3
Reactor vessel internals evaluations (other than fatigue)	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.7.4

Table 4.1-2
Comparison of WF3 TLAAs to NUREG-1800 Potential TLAAs

NUREG-1800 TLAA Description	Applicable to WF3 (Yes/No)	LRA Section
NUREG-1800 Table 4.1-2		
Reactor vessel neutron embrittlement	Yes	4.2
Metal fatigue	Yes	4.3
Environmental qualification of electrical equipment	Yes	4.4
Concrete containment tendon prestress	No. There are no pre-stressed tendons in the WF3 containment structure.	4.5
Inservice local metal containment corrosion analyses	No. There are no metal containment corrosion analyses.	NA
NUREG-1800 Table 4.1-3		
Intergranular separation in the heat-affected zone of reactor vessel low-alloy steel under austenitic stainless steel (SS) cladding.	No. There are no analyses associated with underclad cracking.	NA
Low-temperature overpressure protection (LTOP) analyses	Yes	4.2.5
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pumps	Yes. Included with non-Class 1 fatigue.	4.3.2
Fatigue analysis of the reactor coolant pump flywheel	No. Does not meet the definition of TLAAs, since it does not involve time-limited assumptions defined by the current operating term.	NA
Fatigue analysis of polar crane	Yes	4.7.1
Flow-induced vibration endurance limit for the reactor vessel internals	No. There is no RVI flow-induced vibration analysis meeting the definition of TLAAs.	NA
Transient cycle count assumptions for the reactor vessel internals	Yes	4.3.1.2
Ductility [sic] reduction of fracture toughness for the reactor vessel internals	Yes	4.7.4

Table 4.1-2 (Continued)
Comparison of WF3 TLAAs to NUREG-1800 Potential TLAAs

NUREG-1800 TLAA Description	Applicable to WF3 (Yes/No)	LRA Section
Leak before break	Yes	4.7.2
Fatigue analysis for the containment liner plate	No. No fatigue evaluation performed for containment vessel design.	NA
Containment penetration pressurization cycles	Yes	4.6
Metal corrosion allowance	No. No TLAAs were identified for metal corrosion allowances.	NA
High-energy line-break postulation based on fatigue cumulative usage factor	Yes	4.7.3
Inservice flaw growth analyses that demonstrate structure stability for 40 years	No. No analyses were identified that meet the definition of TLAAs.	NA

4.2 REACTOR VESSEL NEUTRON EMBRITTLEMENT

The regulations governing reactor vessel integrity are in 10 CFR Part 50. Light-water reactors are required by 10 CFR 50.60 to meet the fracture toughness, pressure-temperature limits, and material surveillance program requirements for the reactor coolant pressure boundary set forth in Appendices G and H of 10 CFR Part 50 (Ref. 4-6, 4-7).

The operating license for WF3 expires on December 18, 2024. With a renewed license, the license will expire on December 18, 2044. Through mid-year 2014, WF3 had accumulated approximately 24.7 EFPY of operation. Assuming WF3 is operated at a capacity factor of 99 percent from mid-year 2014 until the end of the renewed license period will result in the following estimate of the EFPY at the end of the period of extended operation.

24.7 + 0.99 (30.5 years of operation after mid-year 2014) = approximately 54.9 EFPY.

Therefore, 55 EFPY will be used to bound the expected EFPY for WF3 at the end of the period of extended operation.

4.2.1 <u>Reactor Vessel Fluence</u>

Fluence is calculated based on a period of operation defined by the operating license term. Fluence projected to the end of the period of extended operation is a time-limited assumption used in neutron embrittlement analyses. Therefore, analyses that evaluate reactor vessel neutron embrittlement based on projected fluence are TLAAs. The neutron fluence values for the WF3 reactor pressure vessel have been projected to 55 EFPY of operation. (Ref. 4-11)

The methods used to calculate the WF3 vessel fluence satisfy the criteria set forth in Regulatory Guide (RG) 1.190 (Ref. 4-8). These methods have been approved by the NRC and are described in detail in WCAP-14040-A, Revision 4, and WCAP-16083-NP-A, Revision 0. (Ref. 4-9, 4-10)

FSAR Section 5.3.1.6 provides additional information on the specimen capsules and the associated dosimeters. See Section B.1.34 for additional information on the Reactor Vessel Surveillance Program. Figure 4.2-1 and Figure 4.2-2 identify the vessel weld and plate names used in this section.

The reactor vessel beltline components with fluence values greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) at 55 EFPY are the three upper shell plates, three upper shell longitudinal welds, upper to intermediate shell circumferential weld, the three lower shell plates, three intermediate shell plates, three intermediate shell longitudinal welds, three lower shell longitudinal welds, and the intermediate shell to lower shell circumferential weld. Locations with fluence values that are greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) are in Tables 4.2-1 and 4.2-3.

Contrary to the definition of TLAAs in 10 CFR 54.3, the calculation of fluence does not consider the effects of aging. Nevertheless, it is treated as a TLAA that has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

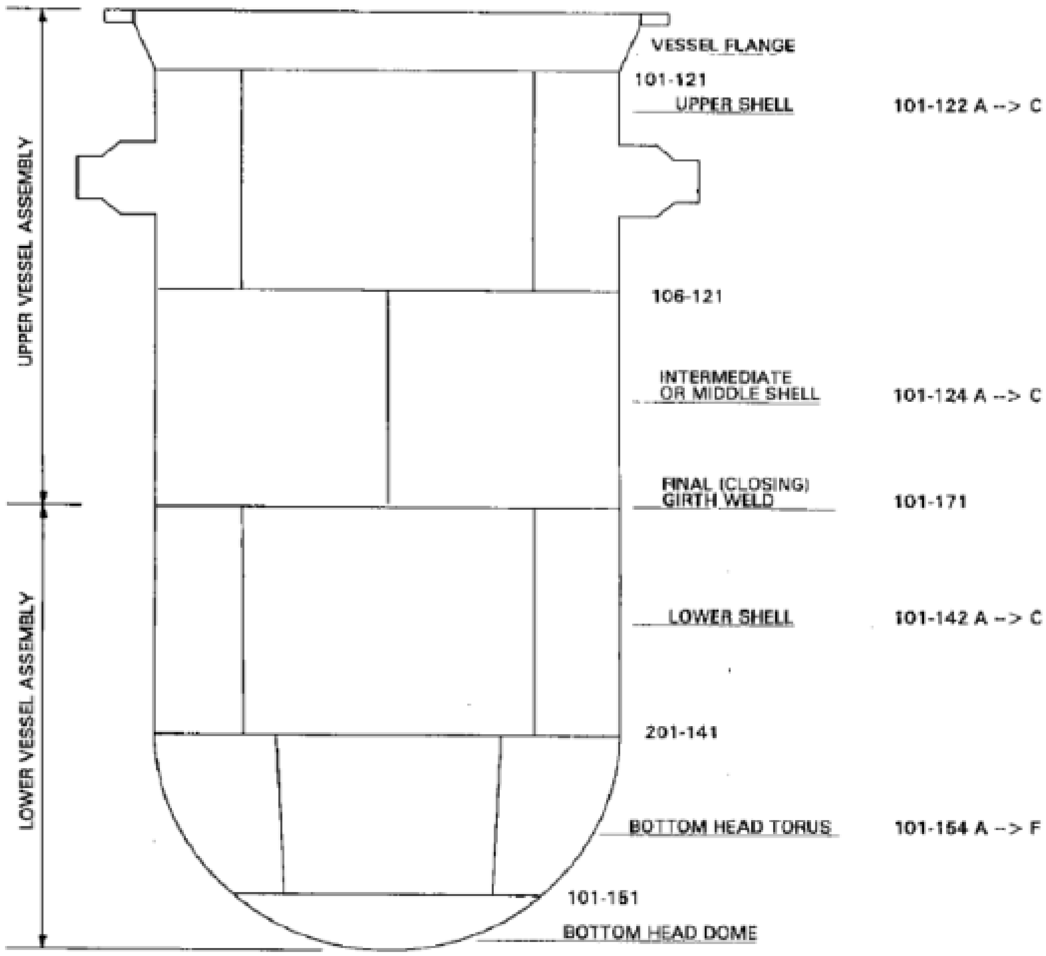

Figure 4.2-1
Reactor Vessel Weld Identification for WF3

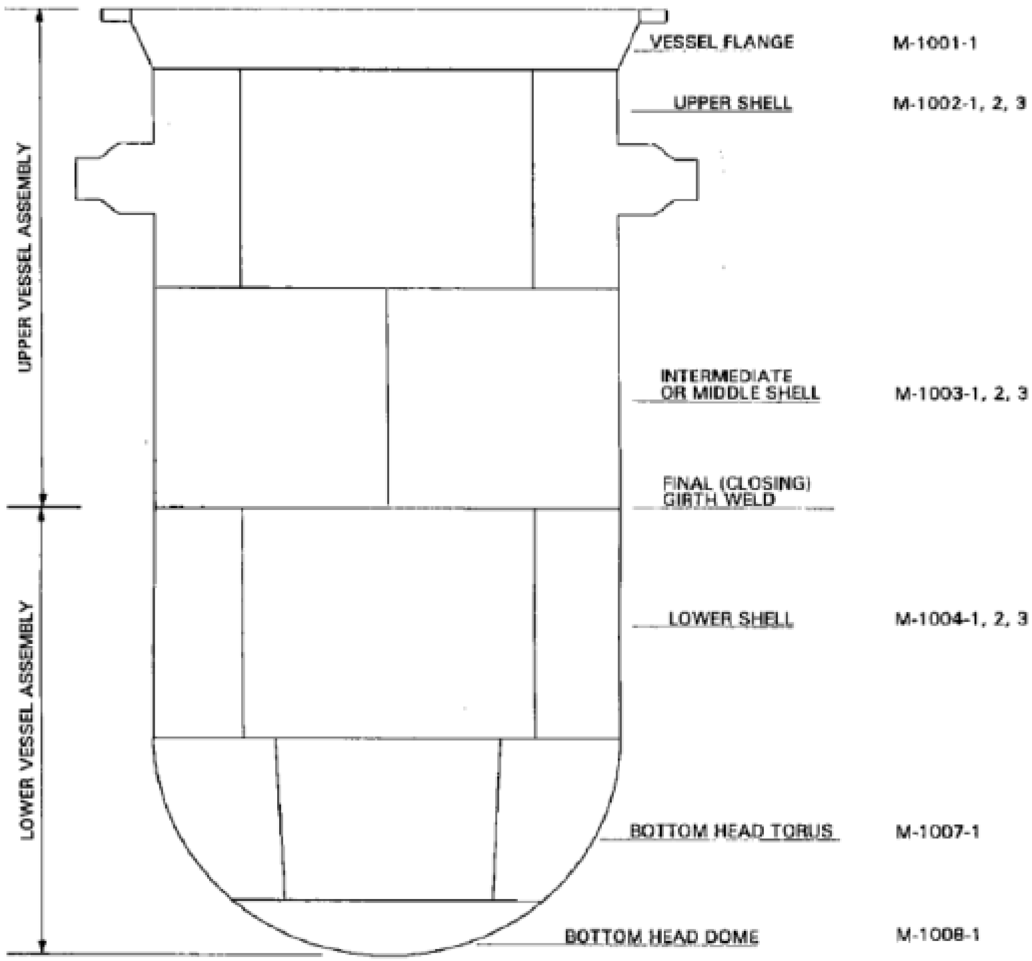

Figure 4.2-2
Reactor Vessel Plate Identification for WF3

Table 4.2-1
Calculated Maximum Fast Neutron Fluence (E+19 n/cm^2, E > 1.0 MeV) Projections for the WF3 Vessel Welds and Plates at 55 EFPY

Location	¼T (Thickness)[a]	At Clad/Base Metal Interface
Intermediate Shell Plates M-1003-1, 2, and 3	2.575	4.28
Lower Shell Plates M-1004-1, 2, and 3	2.575	4.32
Intermediate Shell Longitudinal Weld 101-124A	2.575	4.28
Intermediate Shell Longitudinal Welds 101-124B and C	2.575	2.62
Lower Shell Longitudinal Weld 101-142A	2.575	4.32
Lower Shell Longitudinal Welds 101-142B and C	2.575	2.65
Intermediate to Lower Shell Circumferential Weld 101-171	2.575	4.28
Upper Shell Plates M-1002-1, 2, and 3	0.035	0.0582
Upper Shell Longitudinal Welds 101-122A, B, and C	0.035	0.0582
Upper to Intermediate Shell Circumferential Weld 106-121	0.035	0.0582

a. The ¼T fluence was calculated using the RG 1.99, Revision 2 correlation, and the WF3 reactor vessel wall thickness of 8.625 inches. For intermediate and lower shell weld and plate locations, the maximum fluence value of 2.575 E+19 n/cm2 was applied for conservatism. For upper shell weld and plate locations (last three locations shown), the maximum fluence value of 0.035 E+19 n/cm2 was applied for conservatism.

4.2.2 Upper-Shelf Energy

Upper-shelf energy (USE) was evaluated for beltline materials. Fracture toughness criteria in 10 CFR Part 50 Appendix G require that beltline materials maintain USE no less than 50 ft-lb during operation of the reactor. The 55 EFPY USE values for the beltline materials were determined using methods consistent with RG 1.99 (Ref. 4-12). The value of peak ¼T fluence was used.

Two methods can be used to predict the decrease in USE with irradiation, depending on the availability of credible surveillance capsule data as defined in RG 1.99. For vessel beltline materials that are not in the surveillance program or for locations with non-credible data, the USE is assumed to decrease as a function of fluence and copper (Cu) content, as indicated in RG 1.99, Revision 2 (Position 1.2). When two or more credible surveillance data sets are available from the reactor, they may be used to determine the USE of the surveillance material. The surveillance data are then used in conjunction with RG 1.99 to predict the change in USE of the reactor vessel material due to irradiation (Position 2.2).

The 55 EFPY Position 1.2 USE values of the vessel materials can be predicted using the corresponding ¼T fluence projection, the copper content of the materials, and Figure 2 in RG 1.99, Revision 2. The predicted Position 2.2 USE values are determined for the reactor vessel materials that are contained in the surveillance program by using the plant surveillance data along with the corresponding ¼T fluence projection.

The projected USE values were calculated to determine if the WF3 beltline materials remain no less than the USE limit of 50 ft-lb at 55 EFPY. The results are summarized in Table 4.2-2. For WF3 (see Table 4.2-2), the limiting USE value at 55 EFPY is 73 ft-lb for the upper shell longitudinal welds.

The USE of all of the beltline materials in the WF3 reactor vessel are projected to remain above the USE limit of 50 ft-lb through 55 EFPY. Therefore, the WF3 reactor vessel USE TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-2
Predicted USE Values at 55 EFPY for WF3 RPV Beltline Materials

RPV Material[a]	Cu (Wt. %)	¼T Fluence[b] ($x10^{19}$ n/cm^2)	Initial USE (ft-lb)	Projected USE Decrease[c](%)	55 EFPY USE (ft-lb)
Intermediate Shell Plate M-1003-1	0.02	2.575	108	24	82
Intermediate Shell Plate M-1003-2	0.02	2.575	132	24	100
Intermediate Shell Plate M-1003-3	0.02	2.575	111	24	84
Lower Shell Plate M-1004-1	0.03	2.575	135	24	103
Lower Shell Plate M-1004-2	0.03	2.575	141	24	107
Lower Shell Plate M-1004-2 (using WF3 surveillance data)	0.03	2.575	141	17[d]	117
Lower Shell Plate M-1004-3	0.03	2.575	118	24	90
Intermediate Shell Longitudinal Weld 101-124A (Heat # BOLA & HODA)	0.02	2.575	106	24	81
Intermediate Shell Longitudinal Welds 101-124B & C (Heat # HODA)	0.02	2.575	131	24	100
Lower Shell Longitudinal Welds 101-142A, B & C (Heat # 83653)	0.03	2.575	129	24	98
Intermediate to Lower Shell Circumferential Weld 101-171 (Heat # 88114)	0.05	2.575	156	24	119
Intermediate to Lower Shell Circumferential Weld 101-171 (Heat # 88114) (using WF3 surveillance data)	0.05	2.575	156	15 [d]	133

Table 4.2-2 (Continued)
Predicted USE Values at 55 EFPY for WF3 RPV Beltline Materials (Continued)

RPV Material[a]	Cu (Wt. %)	¼T Fluence[b] ($x10^{19}$ n/cm^2)	Initial USE (ft-lb)	Projected USE Decrease[c](%)	55 EFPY USE (ft-lb)
Upper Shell Plate M-1002-1	0.13	0.035	104	10	94
Upper Shell Plate M-1002-2	0.13	0.035	95	10	86
Upper Shell Plate M-1002-3	0.10	0.035	120	9	109
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # 606L40)	0.23	0.035	88	17	73
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # FOCA)	0.02	0.035	119	7	111
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # JBHA)	0.03	0.035	125	8	115
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # HODA)	0.02	0.035	131	7	122
Upper to Intermediate Shell Circumferential Weld 106-121 (Heat # 3P4767)	0.16	0.035	87	14	75
Upper to Intermediate Shell Circumferential Weld 106-121 (Heat # IAGA)	0.03	0.035	>87	8	> 80
Upper to Intermediate Shell Circumferential Weld 106-121 (Heat # KOHA)	0.03	0.035	113	8	104

a. Table is derived from Table 5-1 of WCAP-18002-NP (Ref. 4-11).

b. The ¼T fluence was calculated using the RG 1.99, Revision 2, correlation, and the WF3 reactor vessel wall thickness of 8.625 inches. For intermediate and lower shell weld and plate locations, the maximum fluence value of 2.575 E+19 n/cm^2 was applied for conservatism. For upper shell weld and plate locations (last 10 locations shown), the maximum fluence value of 0.035 E+19 n/cm^2 was applied for conservatism.

c. Unless otherwise noted, percentage USE decrease values are based on Position 1.2 of RG 1.99, Revision 2, and were determined by plotting the ¼T fluence values on Figure 2 of RG 1.99 and using the material-specific Cu wt. % values. For any materials with Cu wt. % less than the lowest line delineated in RG 1.99, Revision 2 (0.05% for welds and 0.10% for base metal), the Cu wt. % values were conservatively rounded up to the lowest line.

d. Percentage USE decrease is based on Position 2.2 of RG 1.99, Revision 2, using data from Table 5-10 of WCAP-17969-NP, Revision 0. Credibility Criterion 3 in the Discussion section of RG 1.99, Revision 2, indicates that even if the surveillance data are not considered credible for determination of ΔRT_{NDT} (reference temperature, nil-ductility transition), "they may be credible for determining decrease in upper-shelf energy if the upper-shelf can be clearly determined, following the definition given in ASTM E 185-82." Thus, the surveillance data may be used for WF3 USE projections. RG 1.99, Revision 2, Position 2.2 indicates that an upper-bound line drawn parallel to the existing lines (in Figure 2 of RG 1.99) through the surveillance data points should be used in preference to the existing graph lines for determining the decrease in USE.

4.2.3 Pressurized Thermal Shock

Rules are provided in 10 CFR 50.61 for protection against pressurized thermal shock for pressurized water reactors. Licensees must assess the projected values of reference temperature whenever a significant change occurs in projected values of the adjusted reference temperature for pressurized thermal shock (RT_{PTS}) or upon request for a change in the expiration date for the operating license of the facility. In accordance with the screening criteria of 10 CFR 50.61, acceptable RT_{PTS} values are less than 270°F for plates, forgings, and axial welds and less than 300°F for circumferential welds. (Ref. 4-13)

Two methods are provided in 10 CFR 50.61(c) for determining RT_{PTS}. Position 1 applies for material that does not have surveillance data available, and Position 2 applies for material with surveillance data. Positions 1 and 2 are described in RG 1.99, Revision 2. Adjusted reference temperatures are calculated for both Positions 1 and 2 by following the guidance in RG 1.99, Sections 1.1 and 2.1, respectively, using copper and nickel (Ni) content of beltline materials and end-of-license fluence projections.

The WF3 limiting RT_{PTS} value for base metal or longitudinal weld materials at 55 EFPY is 57°F (see Table 4.2-3) at the upper shell plate M-1002-2. The WF3 limiting RT_{PTS} value for circumferentially oriented welds at 55 EFPY is 73°F (see Table 4.2-3) at upper to intermediate shell circumferential weld 106-121 (Heat # 3P4767).

All of the beltline materials in the WF3 reactor vessel are below the RT_{PTS} screening criteria values of 270°F for plates, axial welds, and forgings and 300°F for circumferentially oriented welds through 55 EFPY. Therefore, the WF3 reactor vessel RT_{PTS} TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-3
Calculation of WF3 RT_{PTS} Values at Clad/Base Metal Interface for 55 EFPY

RPV Material[a][b]	Wt. % Cu [c]	Wt. % Ni [c]	CF[c] (^oF)	Fluence[d] (x 10^{19} n/cm^2)	FF[d]	$RT_{NDT(U)}$[e] (^oF)	ΔRT_{NDT} (^oF)	σ_U[e] (^oF)	σ_Δ[f] (^oF)	Margin (^oF)	RT_{PTS} (^oF)
Intermediate Shell Plate M-1003-1	0.02	0.71	20	4.32	1.3726	-25.1	27.5	0	13.7	27.5	30
Intermediate Shell Plate M-1003-2	0.02	0.67	20	4.32	1.3726	-20	27.5	0	13.7	27.5	35
Intermediate Shell Plate M-1003-3	0.02	0.70	20	4.32	1.3726	-20	27.5	0	13.7	27.5	35
Lower Shell Plate M-1004-1	0.03	0.62	20	4.32	1.3726	-37.6	27.5	0	13.7	27.5	17
Lower Shell Plate M-1004-2	0.03	0.58	20	4.32	1.3726	0	27.5	0	13.7	27.5	55
Lower Shell Plate M-1004-2 (using non-credible WF3 surveillance data)[g]	- -	- -	13.4	4.32	1.3726	0	18.4	0	9.2	18.4	37
Lower Shell Plate M-1004-3	0.03	0.62	20	4.32	1.3726	-20	27.5	0	13.7	27.5	35
Intermediate Shell Longitudinal Weld 101-124A (Heat # BOLA & HODA)	0.02	0.96	27	4.32	1.3726	-60	37.1	0	18.5	37.1	14
Intermediate Shell Longitudinal Welds 101-124B & C (Heat # HODA)	0.02	0.96	27	4.32	1.3726	-60	37.1	0	18.5	37.1	14

Table 4.2-3 (Continued)
Calculation of WF3 RT_{PTS} Values at Clad/Base Metal Interface for 55 EFPY (Continued)

RPV Material[a][b]	Wt. % Cu [c]	Wt. % Ni [c]	CF[c] (°F)	Fluence[d] (x 10^{19} n/cm^2)	FF[d]	$RT_{NDT(U)}$[e] (°F)	ΔRT_{NDT} (°F)	σ_U[e] (°F)	σ_Δ[f] (°F)	Margin (°F)	RT_{PTS} (°F)
Lower Shell Longitudinal Welds 101-142A, B & C (Heat # 83653)	0.03	< 0.20	35	4.32	1.3726	-80	48.0	0	24.0	48.0	16
Intermediate to Lower Shell Circumferential Weld 101-171 (Heat # 88114)	0.05	0.16	44.4	4.32	1.3726	-70	60.9	0	28.0	56.0	47
Intermediate to Lower Shell Circumferential Weld 101-171 (Heat # 88114) (using credible WF3 surveillance data)[g]	- -	- -	14.8	4.32	1.3726	-70	20.3	0	10.2	20.3	-29
Upper Shell Plate M-1002-1	0.13	0.64	92	0.0582	0.3174	-15.4	29.2	0	14.6	29.2	43
Upper Shell Plate M-1002-2	0.13	0.61	91.3	0.0582	0.3174	-1.4	29.0	0	14.5	29.0	57
Upper Shell Plate M-1002-3	0.10	0.65	65.5	0.0582	0.3174	-20	20.8	0	10.4	20.8	22

Table 4.2-3 (Continued)
Calculation of WF3 RT_{PTS} Values at Clad/Base Metal Interface for 55 EFPY (Continued)

RPV Material[a][b]	Wt. % Cu [c]	Wt. % Ni [c]	CF[c] (°F)	Fluence[d] (x 10^{19} n/cm^2)	FF[d]	$RT_{NDT(U)}$[e] (°F)	ΔRT_{NDT} (°F)	σ_U[e] (°F)	σ_Δ[f] (°F)	Margin (°F)	RT_{PTS} (°F)
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # 606L40)	0.23	0.27	125.1	0.0582	0.3174	-56[h]	39.7	17[h]	19.9	52.3	36
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # FOCA)	0.02	0.98	27	0.0582	0.3174	-30	8.6	0	4.3	8.6	-13
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # JBHA)	0.03	0.97	41	0.0582	0.3174	-40	13.0	0	6.5	13.0	-14
Upper Shell Longitudinal Welds 101-122 A, B & C (Heat # HODA)	0.02	0.96	27	0.0582	0.3174	-60	8.6	0	4.3	8.6	-43
Upper to Intermediate Shell Circumferential Weld 106-121 (Heat # 3P4767)	0.16	1.00	199	0.0582	0.3174	-56[h]	63.2	17[h]	28.0	65.5	73

Table 4.2-3 (Continued)
Calculation of WF3 RT_{PTS} Values at Clad/Base Metal Interface for 55 EFPY (Continued)

RPV Material[a][b]	Wt. % Cu [c]	Wt. % Ni [c]	CF[c] (°F)	Fluence[d] (x 10^{19} n/cm^2)	FF[d]	$RT_{NDT(U)}$[e] (°F)	ΔRT_{NDT} (°F)	σ_U[e] (°F)	σ_Δ[f] (°F)	Margin (°F)	RT_{PTS} (°F)
Upper to Intermediate Shell Circumferential Weld 106-121 (Heat # IAGA)	0.03	0.98	41	0.0582	0.3174	-30	13.0	0	6.5	13.0	-4
Upper to Intermediate Shell Circumferential Weld 106-121 (Heat # KOHA)	0.03	0.93	41	0.0582	0.3174	-30	13.0	0	6.5	13.0	-4

a. Table is derived from Table 4-1 of WCAP-18002-NP(Ref. 4-11).

b. Due to industry and regulatory interest in the methods of NUREG-0800, BTP 5-3, initial RT_{NDT} and initial USE values for all of the beltline plate materials were re-evaluated. The initial RT_{NDT} and initial USE values for the WF3 plate materials no longer utilize BTP 5-3 as their determination methodology.

c. Chemical composition values and chemistry factors (CFs) provided in WCAP-18002-NP (Ref. 4-11).

d. Clad/base metal interface fluence values taken from WCAP-18002-NP (Ref. 4-11). FF = fluence factor = $f^{(0.28-0.10*\log(f))}$.

e. Initial RT_{NDT} values are based on measured data unless otherwise noted in WCAP-18002-NP (Ref. 4-11).

f. Per Appendix D of WCAP-17969-NP, Revision 0 (Ref. 4-14), and WCAP-18002-NP (Ref. 4-11), the surveillance data for the plate were deemed non-credible, whereas the surveillance data for the weld material were deemed credible. Per the guidance of 10 CFR 50.61, the base metal σ_Δ = 17°F for Position 1.1 and for Position 2.1 with non-credible surveillance data; the weld metal σ_Δ = 28°F for Position 1.1 and, with credible surveillance data, σ_Δ = 14°F for Position 2.1. However, σ_Δ need not exceed 0.5*ΔRT_{NDT}.

g. Used RG 1.99, Rev. 2 Position 2.1; all others used Position 1.1.

h. Initial RT_{NDT} value (-56°F) is generic for Linde 0091 flux type welds per 10 CFR 50.61 as identified in WCAP-18002-NP (Ref. 4-11). Therefore, σ_U = 17°F.

4.2.4 Pressure-Temperature Limits

Appendix G of 10 CFR 50 (Ref. 4-6) requires operation of the reactor pressure vessel within established pressure-temperature (P-T) limits. These limits are established by calculations that utilize the fluence and material property data obtained through the Reactor Vessel Surveillance Program. The P-T limits are valid for an established period of time. The provisions of 10 CFR 50 Appendix G require the P-T limit curves be maintained and updated as necessary.

The WF3 P-T limits for the reactor coolant system are described in Technical Specifications (TS) 3.4.8.1. Technical Specification Figure 3.4-2, Reactor Coolant System Pressure-Temperature Limits, identifies the WF3 heatup limits for up to 32 EFPY. Technical Specification Figure 3.4-3, Reactor Coolant System Pressure–Temperature Limits, identifies the WF3 cooldown limits for up to 32 EFPY.

Technical Specification 4.4.8.1.2 indicates that the reactor vessel material irradiation surveillance specimens shall be removed and examined at the intervals specified in the Reactor Vessel Material Surveillance Program withdrawal schedule in FSAR Table 5.3-10. The schedule is in accordance with 10 CFR Part 50 Appendix H. The examinations are performed to determine changes in material properties, and the results are used to update Technical Specification Figures 3.4-2 and 3.4-3. Surveillance specimen capsule 83° was removed at approximately 24.7 EFPY. (Ref. 4-14)

The analyses used to determine the P-T limit curves in the associated WCAP supporting documentation are considered TLAAs. The WF3 P-T limit curves included in the Technical Specifications are valid through 32 EFPY. Prior to exceeding 32 EFPY, WF3 will generate new P-T limit curves to support plant operation beyond 32 EFPY.

P-T limits will be updated as necessary through the period of extended operation in conjunction with the Reactor Vessel Surveillance Program (Section B.1.34). Under the current license term and during the period of extended operation, the P-T limits will be updated prior to the end of their applicability period in accordance with the 10 CFR 50.90 process. Therefore, the Reactor Vessel Surveillance Program (Section B.1.34) will adequately manage the effects of aging associated with the P-T limit curves TLAAs for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.2.5 Low-Temperature Overpressure Protection (LTOP) Setpoints

The WF3 Technical Specification Bases 3/4.4.2 states that an operating shutdown cooling loop, connected to the RCS, provides overpressure relief capability and will prevent RCS overpressurization. This is accomplished by a low-temperature overpressure protection (LTOP) relief valve located in each shutdown cooling loop as identified in FSAR Section 5.2B.3. In addition, the overpressure protection system provides a diverse means of protection against

RCS overpressurization at low temperatures. Each time the P-T limit curves are revised, the LTOP relief setpoints are reevaluated.

Therefore, the LTOP limit calculations are considered part of the analyses of P-T curves for WF3. The P-T limit curves are updated prior to exceeding EFPY applicability limits. See Section 4.2.4 for further information on the P-T limit curves. Therefore, the Reactor Vessel Surveillance Program (Section B.1.34) will adequately manage the effects of aging associated with the LTOP setpoints TLAA for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3 METAL FATIGUE

Fatigue analyses are considered TLAAs for Class 1 and non-Class 1 mechanical components. Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses.

The aging management reviews in Section 3 identify mechanical components that are within the scope of license renewal and subject to aging management review. When TLAA – metal fatigue is identified in the aging management program column of the tables in Section 3, the associated fatigue analyses are evaluated in this section. Evaluation of TLAAs per 10 CFR 54.21(c)(1) determines whether

(i) The analyses remain valid for the period of extended operation,

(ii) The analyses have been projected to the end of the period of extend operation, or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Documentation of the evaluation of WF3 Class 1 metal fatigue analyses is provided in Section 4.3.1. Fatigue analysis of non-Class 1 mechanical components is discussed in Section 4.3.2. Evaluation of environmental fatigue effects is discussed in Section 4.3.3.

4.3.1 Class 1 Fatigue

The major Class 1 components at WF3 include the reactor vessel, pressurizer, reactor coolant pumps, steam generators, control rod drives, and associated piping and valves. As identified in FSAR Section 5.2.1, the construction permit application for Waterford 3 was filed in December 1970. Major components for the nuclear steam supply system were ordered consistent with the application date and anticipated schedule. The reactor vessel, steam generators, pressurizer and piping were ordered in March 1971 and the reactor coolant pumps in March 1972. The construction permit was received in November 1974. An isometric view of the reactor coolant system is shown in FSAR Figure 4.4-7. The following are systems and associated LRA drawings that include Class 1 components.

System (System Code)	LRA Drawing(s)
Reactor Coolant System (RC)	LRA-G172 LRA-G179 LRA-G160 sh 4
Safety Injection System (SI)	LRA-G167 sh 2 LRA-G167 sh 4
Chemical and Volume Control System (CVC)	LRA-G168 sh 1 LRA-G168 sh 2

Fatigue evaluations performed in the design of WF3 Class 1 components in accordance with ASME Section III requirements are documented in the equipment stress reports and associated analyses. The fatigue evaluations calculate a cumulative usage factor (CUF) for each component or subcomponent based on a specified number of design cycles for that component. Because the design cycles may be the number of transient cycles that were assumed for a 40-year license term, these calculations of CUFs are considered TLAAs.

Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications established the initial set of transients that were used in the design of the components and are included as part of each component stress report. FSAR Table 3.9-1, "Transients Used in Stress Analysis of Code Class 1 Components," lists the transients that were used for the stress analyses of the RCS components. FSAR Table 3.9-3, "Transients and Operative Conditions for Code Class 1 Non-NSSS Piping," identifies the transients that were used as input to the piping stress analyses. Some component-specific locations such as the pressurizer and safety injection nozzles were also analyzed for design transients beyond the original set of transients in response to thermal stratification and component-specific stresses that are identified in the individual stress analyses.

The WF3 Technical Requirements Manual (TRM) 5.7-1 contains the requirement to maintain the reactor coolant system components within the component cyclic or transient limits of TRM Table 5.7-1.

In preparation for license renewal, an evaluation was performed to determine the cycles that required tracking. Then a review of plant operating history identified the number of cycles as of April 5, 2014. The rate of transient occurrence was utilized to estimate the number of cycles through 60 years of operation as shown in Table 4.3-1

As described in Appendix B, the WF3 Fatigue Monitoring Program will monitor transient cycles that contribute to fatigue usage. Cycle monitoring ensures the continuing validity of fatigue TLAAs (calculations of CUFs) for various WF3 components. The Fatigue Monitoring Program (Section B.1.11) will monitor the necessary operating transients and assure action is taken prior to the analyzed numbers of transients being exceeded. The WF3 Fatigue Monitoring Program will manage the aging effects due to fatigue of the affected components in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-1
Projected and Analyzed Transient Cycles

Transient Description	Number of Cycles as of 4/5/14	60-year Projected Number of Cycles[a]	Analyzed Number of Cycles
RCS heatup	70	144	300
Pressurizer heatup	70	144	200
RCS cooldown	69	144	300
Pressurizer cooldown	69	144	200
Reactor trip	91	187	400
Loss of reactor coolant flow	0	4[b]	40
Loss of load	0	4[b]	40
Operating basis earthquake	0	1[b]	5
Bolt/unbolt (RV head)	23	47	50
PZR Spray Transients:			
B1: Aux. spray, > 1 pump, > 350°F	18	37	140
B2: Aux. spray, > 1 pump, ≤ 350°F	7	14	160
C1: Aux. spray, < 2 pumps, > 350°F	151	310	410
C2: Aux. spray, < 2 pumps, ≤ 350°F	129	265	240
D: Stop 3rd RCP, no aux. spray	124	254	400
E: Start 2nd RCP, ≤ 392 psia	124	254	400
Tube leak tests (for replacement steam generators)			
Tube leak test (at 200 psig)	0	40[b]	400
Tube leak test (at 400 psig)	0	20[b]	200
Tube leak test (at 600 psig)	0	12[b]	120
Tube leak test (at 840 psig)	0	8[b]	80
Containment integrated leakage rate test (ILRT)	1	4[b]	20
Loss of charging	4	8	200
Loss of letdown	25	51	100
Extended loss of letdown	131	269	600
Safety valve release	0	4[b]	40
Safety injection at full temperature	0	4[b]	10

a. The original operating license term ends on 12/18/2024 and the renewed operating license term would end on 12/18/2044. The 4/5/2014 data date is at 29.3 years of operation. Unless otherwise identified by a footnote, the projected values are determined by using a multiplier of 60/29.3 = 2.05 times the number of occurrences as of 4/5/2014.
b. Although none of these cycles have occurred, a projected value is conservatively listed. These projected values have not been used to replace the original analyzed numbers of cycles. Cycles will continue to be tracked by the Fatigue Monitoring Program (Section B.1.11).

4.3.1.1 Reactor Vessel

FSAR Table 5.2-1, "Codes and Addenda Applied to Reactor Coolant Pressure Boundary," identifies the codes and addenda applied to the design of the reactor coolant pressure boundary. The reactor vessel was designed to ASME Section III, Class 1 through Summer 1971 Addenda.

The original reactor vessel head has been replaced. The replacement reactor vessel head was designed to ASME Section III, Class 1 1998 edition through summer 2000 addenda.

The calculated CUFs for the reactor vessel and replacement head are less than 1. The reactor vessel design transients that require tracking are included in Table 4.3-1. WF3 will monitor transient cycles using the Fatigue Monitoring Program and assure that corrective action specified in the program is taken if any of the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program (Section B.1.11) will manage the effects of aging due to fatigue on the reactor vessel and reactor vessel head in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.2 Reactor Vessel Internals

The WF3 reactor vessel internals are not pressure boundary components. As described in FSAR Section 3.9.5, in the design of critical reactor vessel internals components that are subject to fatigue, the stress analysis was performed utilizing the design fatigue curve of Figure I-9.2 of Section III of the ASME Boiler and Pressure Vessel Code. Stress reports were generated for several specific reactor vessel internals locations to support component replacement or reanalysis.

The calculated CUFs for the reactor vessel internals are less than 1. The transients identified in Table 4.3-1 include the transients that require tracking for the reactor vessel internals. WF3 will monitor transient cycles using the Fatigue Monitoring Program and assure that corrective action specified in the program is taken if any of the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor vessel internals in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.3 Pressurizer

The pressurizer is described in FSAR Section 5.4.10 and is shown in FSAR Figure 5.4-6. As identified in FSAR Table 5.2-1, the pressurizer was designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, through Summer 1971 Addenda. Structural weld overlays have been installed on the pressurizer surge nozzle, the pressurizer safety valve nozzles, and the pressurizer spray nozzle. The heater sleeves that remain in service were repaired. The pressurizer side shell temperature measurement nozzle and upper and lower head instrument nozzles were replaced.

The calculated CUFs for the pressurizer are less than 1. The transients identified in Table 4.3-1 include the transients that require tracking for the pressurizer. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the pressurizer in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.4 Steam Generators

Replacement steam generators have been installed at WF3 as identified in FSAR Section 5.4.2 and shown in FSAR Figure 5.4-5. As identified in FSAR Table 5.2-1, the replacement steam generators were designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, 1998 Edition through 2000 Addenda. In addition to the RCS transients identified in FSAR Section 3.9.1.1, the replacement steam generators fatigue analysis included evaluation of component specific transients such as the tube leak tests.

The calculated CUFs for the replacement steam generators are less than 1. The transients identified in Table 4.3-1 include the transients that require tracking for the replacement steam generators. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the steam generators in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.5 Control Element Drive Mechanisms

As described in FSAR Section 4.1, the control element drive mechanisms have been replaced. The control element drive mechanisms are described in FSAR Sections 3.9.4 and 4.1 and shown in FSAR Figure 3.9-13. As described in FSAR Table 5.2-1, the replacement control element drive mechanisms are designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, 1998 Edition and 2000 Addenda.

The calculated CUFs for the control element drive mechanisms are less than 1. The transients identified in Table 4.3-1 include the transients that require tracking for the control element drive mechanisms. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the control element drive mechanisms in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.6 Reactor Coolant Pumps

The reactor coolant pumps are described in FSAR Sections 3.9.1 and 5.4.1 and are shown in FSAR Figures 5.4-1 and 5.4-2. As identified in FSAR Table 5.2-1, the pump casings were designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, through Winter 1971 Addenda.

The calculated CUFs for the reactor coolant pumps are less than 1. The transients identified in Table 4.3-1 include the transients that require tracking for the reactor coolant pumps. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor coolant pumps in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.7 Reactor Coolant System Class 1 Piping

The reactor coolant loop piping is discussed in FSAR Section 5.4.3. The hot legs, cold legs and pressurizer surge piping was supplied by the nuclear steam system supplier (NSSS), ABB Combustion Engineering, and controlled by project specifications. The Class 1 tributary lines analyses include consideration of location specific transients such as loss of charging and loss of letdown.

Structural weld overlays (SWOL) have been installed on piping for the hot leg surge nozzle, hot leg two-inch drains, and the hot leg shutdown cooling nozzles.

The calculated piping CUFs are less than 1. The transients identified in Table 4.3-1 include the transients that require tracking for the Class 1 piping. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor coolant system Class 1 piping in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.2 Non-Class 1 Mechanical Systems

4.3.2.1 Non-Class 1 Pressure Boundary Piping Using Stress Range Reduction Factors

The impact of thermal cycles on non-Class 1 piping and in-line components is reflected in the reduction of the allowable stress range if projected cycles exceed 7000. The design of ASME III Code Class 2 and 3 or B31.1 piping systems incorporates a stress range reduction factor for determining acceptability of piping design with respect to thermal stresses. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7000 (ASME Boiler and Pressure Vessel Code, Division 1, Subsection NC, Class 2 Components). For the systems that are subjected to elevated temperatures above the fatigue threshold, thermal cycles have been projected for 60 years of plant operation for the piping and in-line components. These projections indicate that 7000 thermal cycles will not be exceeded during 60 years of operation. Therefore, the non-Class 1 pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.2.2 Flexible Connections and Expansion Joints

As part of the review of the WF3 documentation for fatigue, a search was performed for analyses of mechanical flexible connectors and expansion joints that are within the scope of license renewal. TLAAs were identified for emergency diesel generator intake air and exhaust expansion joints included in LRA tables in Section 3. The review of these analyses determined these flexible connectors were qualified for at least 15,000 cycles, which are more cycles than are expected from the starting of the diesels for the period of extended operation. The design analyses were determined to remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.3.2.3 Non-Class 1 Heat Exchangers with Fatigue Analysis

Although the letdown and regenerative heat exchangers are in the Class 2 portion of the system, a fatigue analysis was completed for the design of these components. The cycle limits are represented in Table 4.3-1. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the letdown and regenerative heat exchangers in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.3 Effects of Reactor Water Environment on Fatigue Life

Industry test data indicate that certain environmental effects (such as temperature and dissolved oxygen content) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. The ASME design fatigue curves were based on laboratory tests in air and at low temperatures.

As reported in SECY-95-245, the NRC believes that no immediate staff or licensee action is necessary to deal with the environmentally assisted fatigue issue. In addition, the staff concluded that it could not justify requiring a backfit of the environmental fatigue data to operating plants. However, the NRC concluded that, because metal fatigue effects increase with service life, environmentally assisted fatigue should be evaluated as aging management programs are formulated in support of license renewal.

NUREG/CR-6260 (Ref. 4-18) addresses the application of environmental factors to fatigue analyses (CUFs) and identifies locations of interest for consideration of environmental effects. NUREG/CR-6260 identified the following component locations to be the most sensitive to environmental effects for Combustion Engineering (CE) plants.

(1) Reactor vessel shell and lower head

(2) Reactor vessel inlet and outlet nozzles

(3) Surge line

(4) Charging system nozzle

(5) Safety injection system nozzle

(6) Shutdown cooling line

Table 4.3-2 shows the results of a screening evaluation for these locations.

Environmentally Assisted Fatigue (EAF) Summary

NUREG-1801, Section X.M1 says the applicant addresses the effects of the coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant. There is no analysis of EAF under the current licensing basis. Rather, the effect on fatigue life of the reactor water environment is a new consideration for license renewal. Applying the environmentally assisted fatigue correction factors (F_{en}s) identified in Table 4.3-2 is not required during the initial 40 years of operation, consistent with the closure of Generic Safety Issue (GSI) 190. (Ref. 4-3)

As shown in Table 4.3-2, using bounding environmental correction factors, two locations have environmentally adjusted projected CUFs greater than 1.0 at the end of the period of extended operation. The WF3 Fatigue Monitoring Program (Section B.1.11) will manage the effects of aging due to fatigue, including EAF, for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

For locations with projected CUFs greater than 1.0, refined EAF evaluations will be completed for WF3 prior to the period of extended operation as identified by the enhancement to the Fatigue Monitoring Program (Section B.1.11).

Original design basis fatigue calculations typically include conservatism meant to simplify the analyses, such as lumping transients together and considering them to be as severe as the worst transient for a particular location. As a part of incorporating the effects on fatigue of the reactor water environment, the design basis fatigue analyses may be revised for locations that would exceed a CUF of 1.0. CUFs will be determined using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case).

WF3 will update the fatigue usage calculations using refined fatigue analyses to determine valid CUFs less than 1.0 when accounting for the effects of reactor water environment prior to the period of extended operation. This includes applying the appropriate F_{en} factors to valid CUFs determined using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case). WF3 will review design basis ASME Class 1 component fatigue evaluations to ensure the locations evaluated for the effects of the reactor coolant environment on fatigue include the most limiting components within the reactor coolant pressure boundary. Environmental effects on fatigue for these critical components will be evaluated using one of the following sets of formulae.

Carbon and Low Alloy Steels (LAS)

- Those provided in NUREG/CR-6583 (Ref. 4-19), using the applicable ASME Section III fatigue design curve.
- Those provided in Appendix A of NUREG/CR-6909 (Ref. 4-20), using either the applicable ASME Section III fatigue design curve or the fatigue design curve for carbon and low alloy steel provided in NUREG/CR-6909 (Figures A.1 and A.2, respectively, and Table A.1).
- A staff-approved alternative.

Austenitic Stainless Steels

- Those provided in NUREG/CR-5704 (Ref. 4-17), using the applicable ASME Section III fatigue design curve.

- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).

- A staff-approved alternative.

Nickel Alloys

- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).

- A staff-approved alternative.

If an acceptable CUF cannot be calculated, WF3 will repair or replace the affected locations before exceeding an environmentally adjusted CUF of 1.0.

Therefore, the WF3 Fatigue Monitoring Program (Section B.1.11) will manage the effects of aging due to fatigue, including EAF, for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-2
EAF Screening Evaluation

NUREG/CR-6260 Generic Location		Plant-Specific Location	Material Type	CUF	F_{en}	EAF CUF
1	Reactor vessel shell and lower head	Vessel shell transition	LAS	0.01	2.45	0.03
1	Reactor vessel shell and lower head	Lower head at juncture with flow baffle	LAS	0.402	2.45	0.99
2	Reactor vessel inlet and outlet nozzles	Inlet nozzle	LAS	0.218	2.45	0.53
2	Reactor vessel inlet and outlet nozzles	Outlet nozzle	LAS	0.401	2.45	0.98
3	Pressurizer surge line (including hot leg and pressurizer nozzles)	Pressurizer surge nozzle	LAS	0.550	2.45	> 1
3	Pressurizer surge line (including hot leg and pressurizer nozzles)	Surge line hot leg nozzle safe end	SS	0.649	15.36	> 1
4	Charging system nozzle	Charging nozzle	SS	0.0191	15.36	0.293
5	Safety injection system nozzle	Safety injection nozzle loop 1A	SS	0.0285	15.36	0.438
6	Shutdown cooling line	SDC Line 2	SS	0.0379	15.36	0.582

4.4 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC EQUIPMENT

All operating plants must meet the requirements of 10 CFR 50.49, which defines the scope of electrical components to be included in an EQ program and also provides the requirements the EQ program must meet. Qualification entails demonstrating the ability to withstand environmental and service conditions during normal plant operation and also those conditions postulated for plant accidents. A record of qualification for in-scope components must be prepared and maintained in auditable form. Equipment qualification evaluations for EQ components that specify a qualification of at least 40 years, but less than 60 years, are considered TLAAs for license renewal.

The WF3 Environmental Qualification (EQ) of Electric Components (WF3 EQ Program) manages the effects of aging due to component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. The WF3 EQ Program ensures that the EQ components are maintained in accordance with their qualification bases.

The WF3 EQ Program is an existing program established to meet WF3 commitments for 10 CFR 50.49. The program is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components." The WF3 EQ Program will manage the effects of aging on the intended function(s) of EQ components that are the subject of EQ TLAAs for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.5 CONCRETE CONTAINMENT TENDON PRESTRESS

This section is not applicable as WF3 does not have pre-stressed tendons in the containment structure, as identified in FSAR Sections 1.8.1.35 and 3.8.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSIS

As identified in FSAR Section 3.8.2.3, the containment vessel was designed to exhibit a general elastic behavior under accident and earthquake conditions of loading. No permanent deformations due to primary stresses have been permitted in the design under any condition of loading. A fatigue evaluation was not performed for the containment vessel design.

WF3 has penetration bellows that are reviewed as part of the structural aging management reviews. As described in FSAR Section 3.6.2.4, these bellows are designed for a minimum of 7000 thermal cycles and 200 design seismic movements (cycles). This number of cycles is more than these expansion joints will experience through the period of extended operation. The analyses remain valid in accordance with 10 CFR 54.21(c)(1)(i).

4.7 OTHER PLANT-SPECIFIC TLAAS

4.7.1 Crane Load Cycle Analysis

Cranes that were designed to Crane Manufacturer's Association of America Specification #70 (CMAA-70) have cycles specified as part of their design analysis. Even though crane analyses do not involve time-limited assumptions defined by the current operating term, for example, 40 years, crane cycle limits are nevertheless evaluated as a TLAA for cranes that were designed to CMAA-70.

CMAA-70 (1975 Edition) Table 3.3.3.1.3-1 identifies crane service classes with corresponding ranges of loading cycles. According to CMAA-70, Service Class A1 cranes are designed for up to 100,000 loading cycles. A review of the cranes at WF3 determined that cranes that were designed to CMAA-70 are the polar crane, fuel handling building (FHB) crane, and the radwaste cask handling bridge crane (located in the auxiliary building). (Ref. 4-15)

The expected number of applicable crane cycles is below the top of the lowest cyclic loading range in CMAA-70 of 100,000 cycles, and the associated TLAAs remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.7.2 Leak-Before-Break Analysis

FSAR Section 3.6.3 identifies that a leak-before-break (LBB) analysis was used to eliminate from the structural design bases the dynamic effects of double-ended guillotine breaks and equivalent longitudinal breaks. LBB analyses consider the thermal aging of cast austenitic stainless steel (CASS) piping and fatigue transients that drive flaw growth during plant operation. Because these two analysis considerations could involve time-limited assumptions defined by the current term of operation, LBB analyses were further reviewed as potential TLAAs for WF3. The applicable locations are the main coolant loop and the pressurizer surge line.

Thermal Aging of CASS

Thermal aging results in an increase in the yield strength of CASS and a decrease in its fracture toughness. Bounding fracture toughness values were used in the evaluation for the main coolant loop and the pressurizer surge line components (Ref. 4-5). Since LBB evaluations use saturated (fully aged) fracture toughness properties, the evaluation of the thermal aging of CASS portion of the analysis does not have a material property time-dependency and is not a TLAA.

Fatigue Crack Growth

The LBB analysis determined that fatigue crack growth effects will be very small when analyzing for the full set of design transients. The fatigue crack growth analysis is considered a TLAA. The basis of the evaluation of fatigue crack growth effects in the LBB analysis will remain unchanged if the number of transient occurrences remains below the number assumed for the analysis of fatigue crack growth effects. Continued implementation of the WF3 Fatigue Monitoring Program provides reasonable assurance that the fatigue crack growth analysis will remain valid during the period of extended operation. Therefore, the Fatigue Monitoring Program (Section B.1.11) will manage the effects of aging associated with the LBB fatigue crack growth analyses for the main coolant loops and pressurizer surge line piping for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.7.3 Postulation of High Energy Line Break (HELB) Locations

As described in FSAR Section 3.6.2.1.1.2, ASME Section III, Code Class 1 piping (excluding RCS loop and surge piping) rupture locations have been postulated in any piping run or branch at terminal ends and other intermediate points in accordance with Regulatory Guide 1.46, Protection Against Pipe Whip Inside Containment (May 1973) and Branch Technical Position MEB 3-1 issued with Generic Letter 87-11, Relaxation in Arbitrary Intermediate Pipe Rupture Requirements. Postulated rupture locations for Class 1 piping are as follows.

(1) Terminal points.

(2) Any intermediate points between terminal ends where the CUF exceeds 0.1 (based upon normal and upset plant conditions and operating basis earthquake [OBE]).

(3) Any intermediate points between terminal ends where the primary plus secondary stress intensities derived on an elastic basis is greater than 2.0 S_m in ferritic and 2.4 S_m in austenitic piping materials (based on normal and upset plant conditions and OBE).

A fatigue analysis to determine a CUF for the intermediate points is considered a TLAA. The Fatigue Monitoring Program (Section B.1.11) identifies when the transients affecting high-energy piping systems are approaching their analyzed number of cycles. Therefore, the CUF calculations used to determine HELB postulated break locations are considered TLAAs that will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.7.4 Reactor Vessel Internals Evaluations (Other than Fatigue)

During service, reactor vessel internal (RVI) and core support component materials are exposed to a high-temperature aqueous environment, fast neutron irradiation and applied loads. WF3 performed evaluations to assess the effect of the extended power uprate (EPU) conditions on the potential for degradation of the RVI component materials. The evaluation addressed age-related degradation mechanisms of materials that could be affected by the reactor coolant temperature and by neutron and gamma irradiation. The evaluations found that neutron and gamma flux are lower than considered in the original design. Therefore, the level of irradiation-induced embrittlement was not expected to change significantly with the uprate. Also, embrittlement of

CASS components as a result of thermal aging and neutron irradiation was not significantly affected by the power uprate. However, evaluations performed associated with the extended power uprate process to determine the effects of fluence on RVI components are considered TLAAs as they were based on operation only until the end of the original 40-year operating term. (Ref. 4-16)

In development of MRP-227-A, the authors considered degradation mechanisms associated with irradiation during plant operation. The inspection and evaluation guidelines of MRP-227-A thus are designed to manage the effects of aging of RVI. The WF3 Reactor Vessel Internals Program incorporates the guidance of MRP-227-A. Therefore, the effects of aging associated with RVI TLAAs will be managed by the Reactor Vessel Internals Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii). (Ref. 4-21, 4-22).

4.8 REFERENCES

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4-18 NUREG/CR-6260 (INEL 95/0045), *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components*, February 1995.

4-19 NUREG/CR-6583 (ANL-97/18), *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels*, February 1998.

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4-22 CWTR3-15-16*, Fluence for Reactor Vessel Internals Aging Management, July 30, 2015.

*Document is a proprietary document.

Appendix A

Final Safety Analysis Report Supplement

Waterford Steam Electric Station, Unit 3
License Renewal Application

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INTRODUCTION

This appendix provides the information to be submitted in a Final Safety Analysis Report (FSAR) Supplement as required by 10 CFR 54.21(d) for the Waterford Steam Electric Station, Unit 3 (WF3) License Renewal Application (LRA). Appendix B of the WF3 LRA provides descriptions of the programs and activities that manage the effects of aging for the period of extended operation. Section 4 of the LRA documents the evaluations of time-limited aging analyses for the period of extended operation. Appendix B and Section 4 have been used to prepare the summary program and activity descriptions for this appendix.

The information presented in this section will be incorporated into the FSAR following issuance of the renewed operating license. Upon inclusion of the FSAR Supplement in the WF3 FSAR, future changes to the descriptions of the programs and activities will be made in accordance with 10 CFR 50.59.

The following information documents aging management programs and activities credited in the WF3 license renewal review (Section A.1) and time-limited aging analyses evaluated for the period of extended operation (Section A.2).

AGING MANAGEMENT PROGRAMS AND ACTIVITIES

The WF3 license renewal application (Reference A.3-1) and information in subsequent related correspondence provided sufficient basis for the NRC to make the findings required by 10 CFR 54.29 (Final Safety Evaluation Report) (Reference A.3-2). As required by 10 CFR 54.21(d), this FSAR supplement contains a summary description of the programs and activities for managing the effects of aging (Section A.1) and a description of the evaluation of time-limited aging analyses for the period of extended operation (Section A.2). The period of extended operation is the 20 years after the expiration date of the original operating license for WF3.

A.1 AGING MANAGEMENT PROGRAMS

The integrated plant assessment for license renewal identified aging management programs necessary to provide reasonable assurance that structures and components subject to aging management review will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation. This section describes the aging management programs and activities required during the period of extended operation. Aging management programs will be implemented prior to entering the period of extended operation.

The corrective action, confirmation process, and administrative controls of the WF3 (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities during the period of extended operation. WF3 quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR 50, Appendix B. The WF3 Quality Assurance Program applies to safety-related structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished in accordance with the established WF3 corrective action program and document control program and are applicable to all aging management programs and activities during the period of extended operation. The confirmation process is part of the corrective action program and includes reviews to assure adequacy of corrective actions, tracking and reporting of open corrective actions, and review of corrective action effectiveness. Any follow-up inspection required by the confirmation process is documented in accordance with the corrective action program.

Operating experience from plant-specific and industry sources is identified and systematically reviewed on an ongoing basis. The WF3 corrective action program, which is implemented in accordance with the quality assurance program, effects the documentation and evaluation of plant-specific operating experience. The WF3 operating experience program, which meets the provisions of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff," systematically evaluates industry operating experience. The operating experience program includes active participation in the Institute of Nuclear Power Operations' operating experience program, as endorsed by the NRC.

In accordance with these programs, site-specific and industry operating experience items are screened to determine whether they involve lessons learned that may impact aging management programs (AMPs). Items are evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined that the effects of aging are not adequately managed. Plant-specific operating experience associated with managing the effects of aging is reported to the industry in accordance with guidelines established in the operating experience review program.

Training provided for personnel responsible for submitting, screening, assigning, evaluating, or otherwise processing plant-specific and industry operating experience, as well as for personnel responsible for implementing AMPs, is based on the complexity of the job performance requirements and assigned responsibilities. Training is scheduled on a recurring basis, which accommodates the turnover of plant personnel and the need for new training content.

A.1.1 Bolting Integrity Program

The Bolting Integrity Program manages loss of preload, cracking, and loss of material for pressure-retaining closure bolting using preventive measures and inspection activities. The Reactor Head Closure Stud Program (Section A.1.32) manages the aging effects on the reactor head closure studs, and the Structures Monitoring Program (Section A.1.38) manages the aging effects on structural bolting. Preventive measures include material selection (e.g., use of materials with an actual yield strength of less than 150 kilo-pounds per square inch [ksi]), lubricant selection (e.g., restricting the use of molybdenum disulfide), applying the appropriate preload (torque), and checking for uniformity of gasket compression where appropriate to preclude loss of preload, loss of material, and cracking. This program supplements the inspection activities required by ASME Section XI for ASME Class 1, 2 and 3 pressure-retaining bolting. For ASME Class 1, 2 and 3 bolting and non-ASME Code class bolts, periodic system inspections (at least once per refueling cycle) ensure identification of indications of loss of preload, cracking, and loss of material before leakage becomes excessive. Applicable industry standards and guidance documents, including NUREG-1339, EPRI NP-5769, and EPRI TR-104213, were used to develop the program implementing procedures.

The preventive measures of the Bolting Integrity Program manage loss of preload for buried fire water system bolting, which is inspected under the Buried and Underground Piping and Tanks Program (Section A.1.3).

The Bolting Integrity Program will be enhanced as follows.

- Revise Bolting Integrity Program procedures to include submerged pressure retaining bolting.
- Revise Bolting Integrity Program procedures to monitor high strength bolting locations (i.e., bolting with actual yield strength greater than or equal to 150 ksi) for cracking.

- Revise Bolting Integrity Program procedures to include a volumetric examination per ASME Code Section XI, Table IWB-2500-1 for high-strength closure bolting with actual yield strength greater than or equal to 150 ksi regardless of code classification.

Enhancements will be implemented prior to the period of extended operation.

A.1.2 Boric Acid Corrosion Program

The Boric Acid Corrosion Program manages loss of material and increase in connection resistance for components on which borated water may leak. The program includes (a) visual inspection of external surfaces that are potentially in an environment of borated water leakage, including mechanical, electrical and structural components; (b) timely identification of leak path and removal of boric acid residues; (c) assessment of degradation due to corrosion, if any; and (d) follow-up inspection for adequacy. This program was implemented in response to NRC Generic Letter (GL) 88-05 and industry operating experience.

The program provides systematic measures to identify borated water leakage and ensure that corrosion caused by leaking borated water does not lead to unacceptable degradation of the leakage source or adjacent structures or electrical components. Visual inspections are performed to identify boric acid deposits, discoloration, staining, and moisture in areas of borated water leakage. If evidence of leakage is identified, the necessary actions are taken to determine the exact location and cause of the leakage. When leakage is discovered by other activities (normal plant walkdowns, maintenance, etc.), the Boric Acid Corrosion Program provides for evaluations and assessments to identify and correct boric acid leakage before loss of intended function of affected components. These corrective actions include modifications to equipment design or operating procedures to reduce the probability of boric acid leakage at locations where such leaks may cause corrosion damage.

A.1.3 Buried and Underground Piping and Tanks Inspection Program

The Buried and Underground Piping and Tanks Inspection Program manages the effects of aging on external surfaces of buried piping components subject to aging management review. There are no buried tanks subject to aging management review. The program will manage loss of material and cracking through preventive, mitigative (e.g., coatings, backfill quality, and cathodic protection), and periodic inspection activities. Program activities include verification of effective cathodic protection, non-destructive evaluation of pipe wall thickness, hydrostatic testing of piping, and visual inspection of the exterior of buried piping, fire hydrant and valve body components as permitted by opportunistic and directed excavations.

This program will be implemented prior to the period of extended operation.

A.1.4 Coating Integrity

The Coating Integrity Program consists of periodic visual inspections of coatings applied to the internal surfaces of in-scope components in an environment of raw water, treated water, lubricating oil, or fuel oil where loss of coating or lining integrity could impact the component's and downstream component's current licensing basis intended function(s). For coated surfaces that do not meet the acceptance criteria, physical testing is performed where physically possible in conjunction with coating repair or replacement. The training and qualification of individuals involved in coating inspections of noncementitious coatings are conducted in accordance with ASTM standards endorsed in Regulatory Guide (RG) 1.54 including limitations, if any, identified in RG 1.54 on a particular standard. For cementitious coatings, training and qualifications are based on an appropriate combination of education and experience related to inspecting concrete surfaces.

This program will be implemented prior to the period of extended operation.

A.1.5 Compressed Air Monitoring Program

The Compressed Air Monitoring Program manages loss of material in compressed air systems by periodically monitoring the air for moisture and contaminants and by inspecting system internal surfaces. Air quality is maintained in accordance with limits based on consideration of manufacturer recommendations as well as guidelines in EPRI NP-7079, EPRI TR-108147, ASME OM-S/G-1998 (Part 17), and ANSI/ISA-S7.0.01-1996. Inspection frequencies and acceptance criteria are in accordance with SOER 88-01 and applicable industry standards. Documents such as EPRI NP-7079, ASME OM-S/G-1998 (Part 17), and ANSI/ISA-S7.0.1-1996 provide guidance on preventive measures, inspection of components, and testing and monitoring air quality. Periodic and opportunistic internal visual inspections of components (accumulators, flex hoses, tubing, etc.) are performed to monitor for signs of corrosion. Air quality parameters are trended to determine if alert levels or limits are being approached or exceeded.

The Compressed Air Monitoring Program will be enhanced as follows.

- Revise Compressed Air Monitoring Program procedures to include the EDG starting air system.
- Revise Compressed Air Monitoring Program procedures to apply consideration of the guidance of ASME OM-S/G-1998 (Part 17), EPRI NP-7079, and EPRI TR-108147 to the limits specified for the air system contaminants.
- Revise Compressed Air Monitoring Program procedures to include periodic and opportunistic visual inspections of accessible internal surfaces of system components, including accumulators, flex hoses and tubing. Specify inspections at frequencies recommended in ASME OM-S/G-1998 (Part 17).

Enhancements will be implemented prior to the period of extended operation.

A.1.6 Containment Inservice Inspection – IWE Program

The Containment Inservice Inspection (CII) – IWE Program implements the requirements of 10 CFR 50.55a. The regulations in 10 CFR 50.55a impose the inservice inspection (ISI) requirements of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel (B&PV) Code, Section XI, Subsection IWE, for steel containments (Class MC) and steel liners for concrete containments (Class CC). The WF3 containment is a low-leakage, free-standing steel containment vessel (SCV) consisting of a vertical upright cylinder with a hemispherical dome and an ellipsoidal bottom. The SCV's ellipsoidal bottom is encased in concrete and founded on the common concrete foundation with the shield building. The common concrete foundation with the shield building is classified as Class CC equivalent. The steel ellipsoidal bottom plate of the SCV was erected on top of the common concrete foundation slab with a concrete slab poured on top of the bottom plate. Since the Class CC equivalent concrete foundation slab and the bottom steel plate are inaccessible, they are exempted from examination in accordance with IWL-1220(b) and IWE-1220(b). There are no tendons associated with the WF3 SCV. The code of record for the examination of the WF3 Class MC and Class CC components is ASME Code Section XI, Subsections IWE and IWL, 2001 Edition with the 2003 Addenda, as mandated and modified by 10 CFR 50.55a.

The CII-IWE Program includes provisions to ensure that the selection of bolting material, installation torque or tension, and the use of lubricants and sealants are appropriate for the intended purpose. Implementing procedures use recommendations delineated in NUREG-1339 and industry recommendations delineated in Electric Power Research Institute (EPRI) NP-5769, NP-5067 and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque.

The CII-IWE Program will be enhanced as follows.

- Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting from Section 2 of Research Council on Structural Connections publication, “Specification for Structural Joints Using ASTM A325 or A490 Bolts.”

Enhancements will be implemented prior to the period of extended operation.

A.1.7 Containment Leak Rate Program

The Containment Leak Rate Program consists of tests performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” Option B; RG 1.163, "Performance-Based Containment Leak-Testing Program”; NEI 94-01, “Industry Guideline for

Implementing Performance-Based Options of 10 CFR Part 50, Appendix J"; and ANSI/ANS 56.8, "Containment System Leakage Testing Requirements."

Three types of tests are performed under Option B. Type A tests are performed to determine the overall primary containment integrated leakage rate at the loss of coolant accident peak containment pressure. Performance of the integrated leakage rate test (ILRT) per 10 CFR Part 50, Appendix J, Option B, demonstrates the leak-tightness and structural integrity of the containment. Type B and Type C containment local leakage rate tests (LLRTs), as defined in 10 CFR Part 50, Appendix J, are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. Containment leakage rate tests are performed at frequencies in accordance with the provisions of 10 CFR Part 50, Appendix J, Option B.

A.1.8 Diesel Fuel Monitoring Program

The Diesel Fuel Monitoring Program manages loss of material and reduction of heat transfer due to fouling in piping, tanks and other components in an environment of diesel fuel oil. This is performed by receipt inspection before allowing fuel oil to enter the storage tanks. Parameters monitored include water content, sediment, total particulate, and levels of microbiological activity. The program includes multi-level sampling of fuel oil storage tanks. Where multi-level sampling cannot be performed due to design, a representative sample is taken from the lowest part of the tank. When biological activity is identified, biocides are added.

The Diesel Fuel Monitoring Program inspects low flow areas where contaminants may collect such as in the bottom of tanks. The tanks are periodically sampled, drained, cleaned, and inspected for signs of moisture, contaminants and corrosion. Internal tank inspections will be performed at least once during the 10-year period prior to the period of extended operation and at least once every 10 years during the period of extended operation. Where degradation is observed, a wall thickness determination is made, and the extent of the condition is verified as a part of the corrective action program. Applicable industry standards and guidance documents are used to establish sampling frequency unless specified in Technical Specifications. The One-Time Inspection Program (Section A.1.28) includes inspections to verify that the Diesel Fuel Monitoring Program has been effective at managing the effects of aging.

The Diesel Fuel Monitoring Program will be enhanced as follows.

- Revise the Diesel Fuel Monitoring Program procedures to include the auxiliary diesel generator fuel oil tank and the emergency diesel generator (EDG) fuel oil feed tanks.

- Revise Diesel Fuel Monitoring Program procedures to monitor and trend water content, sediment, particulates, and microbiological activity in the fuel oil tanks within the scope of the program at least quarterly.

- Revise Diesel Fuel Monitoring Program procedures to include periodic multi-level sampling of the tanks within the scope of the program. Include provisions to obtain a representative sample from the lowest point in the tank, if tank design does not allow for multi-level sampling.

- Revise Diesel Fuel Monitoring Program procedures to include periodic cleaning and internal visual inspection of tanks within the scope of the program. In the areas of any degradation identified during the internal inspection, a volumetric inspection shall be performed. In the event an internal inspection cannot be performed due to design limitations, a volumetric examination shall be performed. Perform cleaning and internal inspections at least once during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals.

Enhancements will be implemented prior to the period of extended operation.

A.1.9 Environmental Qualification (EQ) of Electric Components Program

The Environmental Qualification (EQ) of Electric Components Program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limits established in the evaluation. Reanalysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions. Some aging evaluations for EQ components are time-limited aging analyses (TLAAs) for license renewal.

A.1.10 External Surfaces Monitoring Program

The External Surfaces Monitoring Program manages aging effects of components fabricated from metallic, elastomeric, and polymeric materials through periodic visual inspection of external surfaces for evidence of loss of material, cracking, and change in material properties.   When appropriate for the component and material, physical manipulation, such as pressing, flexing and bending, is used to augment visual inspections to confirm the absence of elastomer hardening and loss of strength. External Surfaces Monitoring Program is also credited for situations where the material and environment combinations are the same for the internal and external surfaces such that the external surfaces are representative of the internal surfaces.

Inspections are performed at least once every refueling cycle by personnel qualified through a plant-specific program. Deficiencies are documented and evaluated under the corrective action program. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the component’s intended functions are maintained.

Periodic representative surface inspections of the in-scope mechanical indoor components under insulation (with process fluid temperature below the dew point) and outdoor components under insulation will be performed.

For polymeric materials, the visual inspection will include 100 percent of the accessible components. The sample size of flexible polymeric components that receive physical manipulation is at least 10 percent of the available surface area.

Acceptance criteria are defined to ensure that the need for corrective action is identified before a loss of intended function. For stainless steel, a clean shiny surface is expected. For flexible polymeric materials, a uniform surface texture (no cracks) and no change in material properties (e.g., hardness, flexibility, physical dimensions, color unchanged from when the material was new) are expected. For rigid polymeric materials, acceptable conditions are no surface changes affecting performance, such as erosion, cracking, crazing, checking, and chalking.

The External Surfaces Monitoring Program will be enhanced as follows.

- Revise External Surfaces Monitoring Program procedures to include instructions to perform a 100 percent visual inspection of accessible flexible polymeric component surfaces. The visual inspection should identify indicators of loss of material due to wear to include dimensional change, surface cracking, crazing, scuffing, and for flexible polymeric materials with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal. In addition, 10 percent of the available flexible polymeric surface area should receive physical manipulation to augment the visual inspection to confirm the absence of hardening and loss of strength (e.g., HVAC flexible connectors) .

- Revise External Surfaces Monitoring Program procedures to conduct representative inspections during each 10-year period on insulated surfaces of each material type (e.g., steel, stainless steel, copper alloy, aluminum) in an air–outdoor or condensation environment.

- Revise External Surfaces Monitoring Program procedures as follows:

    - Remove insulation in order to perform a visual inspection of a representative sample of insulated indoor component surfaces in a condensation environment and outdoor component surfaces. The inspections shall include a minimum of 20 percent of the in-scope piping length for each material type (e.g., steel, stainless steel, copper alloy, aluminum), or for components with a configuration which does not conform to a 1-foot axial length determination (e.g., valve, accumulator), 20 percent of the surface area. Alternatively, insulation can be removed and a minimum of 25 inspections performed that can be a combination of 1-foot axial length sections and individual components for each material type.

- Include inspection locations based on the likelihood of corrosion under insulation (i.e., components experiencing alternate wetting and drying in environments where trace contaminants could be present and for components that operate for long periods of time below the dew point).

- Allow subsequent inspections to consist of an examination of the exterior surface of the insulation for indications of damage to the jacketing or protective outer layer of the insulation, if the following conditions are verified in the initial inspection: no loss of material due to general, pitting or crevice corrosion, beyond that which could have been present during initial construction, and no evidence of cracking.

- Ensure that if the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or there is evidence of water intrusion through the insulation (e.g., water seepage through insulation seams or joints), periodic inspections under the insulation will continue at such intervals that would ensure the component's intended function.

- Revise External Surfaces Monitoring Program procedures to provide guidance that removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. However, the entire population of in-scope accessible piping component surfaces that have tightly adhering insulation will be visually inspected for damage to the moisture barrier with the same frequency as for other types of insulation inspections. These inspections will not be credited towards the inspection quantities for other types of insulation.

- Revise External Surfaces Monitoring Program procedures to include the following acceptance criteria.

  - Stainless steel should have a clean shiny surface with no discoloration.

  - Other metals should not have any abnormal surface indications.

  - Flexible polymeric materials should have a uniform surface texture and color with no cracks and no unanticipated dimensional change, no abnormal surface with the material in an as-new condition with respect to hardness, flexibility, physical dimensions, and color.

  - Rigid polymeric materials should have no erosion, cracking, checking or chalking.

Enhancements will be implemented prior to the period of extended operation.

A.1.11 Fatigue Monitoring Program

The Fatigue Monitoring Program ensures that fatigue usage remains within allowable limits for components identified to have a fatigue TLAA by (a) tracking the number of critical thermal and pressure transients for selected components, (b) verifying that the severity of monitored transients is bounded by the design transient definitions for which they are classified, and (c) assessing the impact of the reactor coolant environment on a set of sample critical components including those from NUREG/CR-6260 and those components identified to be more limiting than the components specified in NUREG/CR-6260. Tracking the number of critical thermal and pressure transients for the selected components ensures a cumulative usage factor (CUF) for fatigue within allowable limits, including environmental effects where applicable.

The Fatigue Monitoring Program will be enhanced as follows.

- Revise Fatigue Monitoring Program procedures to monitor and track additional critical thermal and pressure transients for components that have been identified to have a fatigue TLAA.

- Develop a set of fatigue usage calculations that consider the effects of the reactor water environment for a set of sample reactor coolant system components. This sample shall include the locations identified in NUREG/CR-6260 and additional plant-specific component locations in the reactor coolant pressure boundary if they are found to be more limiting than those considered in NUREG/CR-6260. F_{en} factors shall be determined using the formulae recommended in NUREG-1801, X.M1.

- Revise Fatigue Monitoring Program procedures to provide updates of the fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached or in a case where a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components has been modified.

Enhancements will be implemented prior to the period of extended operation.

A.1.12 Fire Protection Program

The Fire Protection Program manages cracking, loss of material, delamination, separation, and change in material properties (e.g., shrinkage, loss of strength) through periodic visual inspection of components and structures with a fire barrier intended function (i.e., seals, fire barrier walls, ceilings, floors, and other fire resistant materials, such as flamastic, fire wrapping, spray-on fire proofing material, etc.). The program also performs periodic visual and functional testing of fire doors to ensure their operability.

The program includes visual inspections of not less than 10 percent of each type of penetration fire seal at least once per refueling cycle. Visual inspections of the fire barrier walls, ceilings and floors in structures within the scope of license renewal are performed at a frequency of at least once per refueling cycle. The frequency of visual inspections of the fire door surfaces and functional testing of fire door closing mechanisms and latches is at least once per refueling cycle.

The Fire Protection Program will be enhanced as follows.

- Revise Fire Protection Program procedures to include an inspection at least once per refueling cycle of fire barrier walls, ceilings, and floors for any signs of degradation, such as spalling, loss of material caused by chemical attack, or reaction with aggregates.

- Revise Fire Protection Program procedures to inspect fire-rated doors for any degradation of door surfaces at least once per refueling cycle.

- Revise Fire Protection Program procedures to ensure fire barrier seals are inspected by personnel qualified in accordance with appropriate NFPA standards.

- Revise Fire Protection Program procedures to provide acceptance criteria of no significant indications of concrete spalling, and loss of material of fire barrier walls, ceilings, and floors and in other fire barrier materials.

- Revise Fire Protection Program procedures to provide acceptance criteria that specify no surface degradation of fire doors.

Enhancements will be implemented prior to the period of extended operation.

A.1.13 Fire Water System Program

The Fire Water System Program manages loss of material, flow blockage due to fouling, and loss of coating integrity for in-scope long-lived passive water-based fire suppression system components using periodic flow testing and visual inspections. When visual inspections are used to detect loss of material and fouling, the inspection technique is capable of detecting surface irregularities that could indicate wall loss due to corrosion, corrosion product deposition, and flow blockage due to fouling.

Testing or replacement of sprinkler heads that have been in service for 50 years is performed in accordance with the 2011 Edition of NFPA 25. Portions of the water-based fire water system that (a) are normally dry, but periodically subject to flow (e.g., dry-pipe or downstream of the deluge valve in a deluge system) and b) cannot be drained or allow water to collect are subject to augmented examination beyond that specified in NFPA 25. The augmented examinations for the portions of normally dry piping that are periodically wetted or experiencing recurring internal corrosion include (a) periodic full flow tests at the design pressure and flow rate, or internal inspections, and (b) volumetric wall thickness evaluations.

The training and qualification of individuals involved in fire water storage tank coating inspections is conducted in accordance with ASTM International standards endorsed in RG 1.54, including limitations, if any, identified in RG 1.54 on a particular standard.

Program acceptance criteria include (a) the water-based fire protection system can maintain required pressure, (b) no unacceptable signs of degradation or fouling are observed during non-intrusive or visual inspections, and (c) in the event surface irregularities are identified, testing is performed to ensure minimum design pipe wall thickness is maintained. In the event the fire water tank fails to meet the acceptance criteria for coating or the tank (e.g., peeling, delamination, blistering, flaking, cracking, or rust), the program requires an evaluation to ensure the tank can perform its intended function until the next inspection and that downstream flow blockage is not a concern.

The Fire Water System Program will be enhanced as follows.

- Revise Fire Water System Program Procedures to inspect for loss of fluid in the glass bulb heat responsive elements.
- Revise Fire Water System Program procedures to perform an inspection of wet fire water system piping condition every 5 years by opening a flushing connection at the end of one main and by removing a sprinkler toward the end of one branch line for the purpose of inspecting the interior for evidence of loss of material and the presence of foreign organic or inorganic material that could result in flow obstructions or blockage of a sprinkler head. The inspection method used shall be capable of detecting surface irregularities that could indicate wall loss below nominal pipe wall thickness due to corrosion, corrosion product deposition, and flow blockage due to fouling. Ensure procedures require a follow-up volumetric wall thickness evaluation where irregularities are detected.
- Revise Fire Water System Program procedures to perform an internal inspection for evidence of loss of material and the presence of foreign organic or inorganic material that could result in flow obstructions or blockage of a sprinkler head of the dry piping downstream of preaction systems. The inspection method used shall be capable of detecting surface irregularities that could indicate wall loss below nominal pipe wall thickness due to corrosion, corrosion product deposition, and flow blockage due to fouling.
- Revise Fire Water System Program procedures to perform an internal inspection for evidence of loss of material and the presence of foreign organic or inorganic material that could result in flow obstructions or blockage of a sprinkler head of the dry piping downstream of the automatic deluge systems. The inspection method used shall be capable of detecting surface irregularities that could indicate wall loss below nominal pipe wall thickness due to corrosion, corrosion product deposition, and flow blockage due to fouling.

- Revise Fire Water System Program procedures to perform an inspection of the nozzles associated with the charcoal filters for loss of material and foreign or organic material when the charcoal is replaced.

- Revise Fire Water System Program procedures to inspect the interior of the fire water tanks in accordance with NFPA 25 (2011 Edition), Sections 9.2.6 and 9.2.7, including sub-steps.

- Revise Fire Water System Program procedures to remove strainers every 5 years to clean and inspect for damage and corroded parts.

- Revise Fire Water System Program procedures to specify that sprinkler heads are tested or replaced in accordance with NFPA-25 (2011 Edition), Section 5.3.1.

- Revise Fire Water System Program procedures to conduct a flow test or flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or piping segments that allow water to collect in each 5-year interval, beginning 5 years prior to the period of extended operation.

- Revise Fire Water System Program procedures to perform volumetric wall thickness inspections of 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect each 5-year interval of the period of extended operation. Measurement points shall be obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, microbiologically induced corrosion [MIC]). The 20 percent of piping that is inspected in each 5-year interval is in different locations than previously inspected piping.

- Revise the Fire Water System Program procedures to perform a blockage evaluation if the flowing pressure decreases by more than 10 percent from the original main drain test or previous main drain tests.

- Revise the Fire Water System Program procedures to flow test the charcoal filter unit's manual deluge valve systems with air on an annual basis to ensure there are no obstructions. If obstructions are found, the system shall be cleaned and retested.

- Revise the Fire Water System Program procedures to trip test with flow at least once every 18 months the deluge valve systems for the main turbine lube oil tank and main feedwater pumps. If obstructions are found, the system shall be cleaned and retested.

- Revise the Fire Water System Program procedures to open and close hydrant valves slowly while performing flow tests to prevent surges in the system. The program shall also require full opening of the hydrant valve.

- Revise the Fire Water System Program procedures to verify the hydrants drain within 60 minutes after flushing or flow testing.

- Revise Fire Water System Program procedures to perform vacuum box testing on the bottom of the tank to identify leaks. In the event the bottom of the fire water tank is uneven, the station will perform a suitable NDE technique rather than vacuum box testing to identify leaks.

- Revise the Fire Water System Program procedures to ensure the training and qualification of the individual performing the evaluation of fire water storage tank coating degradation is in accordance with ASTM International standards endorsed in RG 1.54, including limitations, if any, identified in RG 1.54 on a particular standard.

- Revise Fire Water System Program procedures to perform wet sponge and dry film testing on the coating applied to the interior of the fire water tanks.

- Revise Fire Water System Program procedures to conduct augmented flow tests or flushing and wall thickness measurements for fire water piping experiencing recurring internal corrosion prior to the period of extended operation and at least once every 5 years during the period of extended operation. Procedures shall be revised to require wall thickness measurements at selected locations that provide a representative sample of the type of piping and environment where the recurring corrosion is occurring. The procedure should allow for selected grid locations to change based on the relevance and usefulness of the wall thickness measurements.

- Revise the Fire Water System Program procedures to ensure a fire water tank is not returned to service after identifying interior coating blistering, delamination or peeling unless there are only a few small intact blisters surrounded by coating bonded to the substrate as determined by a qualified coating inspector, or the following actions are performed:

    - Any blistering in excess of a few small intact blisters or blistering not completely surrounded by coating bonded to the substrate is removed.

    - Any delaminated or peeled coating is removed.

    - The exposed underlying coating is verified to be securely bonded to the substrate as determined by an adhesion test endorsed by RG 1.54 at a minimum of three locations.

    - The outermost coating is feathered and the remaining outermost coating is determined to be securely bonded to the coating below via an adhesion test endorsed by RG 1.54 at a minimum of three locations adjacent to the defective area.

- Ultrasonic testing is performed where there is evidence of pitting or corrosion to ensure the tank meets minimum wall thickness requirements.
- An evaluation is performed to ensure downstream flow blockage is not a concern.
- A follow-up inspection is scheduled to be performed within two years and every two years after that until the coating is repaired, replaced, or removed.

- Revise Fire Water System Program procedures to determine the extent of coating defects on the interior of the fire water tanks by using one or more of the following methods when conditions such as cracking, peeling, blistering, delamination, rust, or flaking are identified during visual examination.
  - Lightly tapping and scraping the coating to determine the coating integrity.
  - Dry film thickness measurements at random locations to determine overall thickness of the coating.
  - Wet-sponge testing or dry film testing to identify holidays in the coating.
  - Adhesion testing in accordance with ASTM D3359, ASTM D4541, or equivalent testing endorsed by RG 1.54 at a minimum of three locations.
  - Ultrasonic testing where there is evidence of pitting or corrosion to determine if the tank thickness meets the minimum thickness criteria.
- Revise Fire Water System Program procedures to include acceptance criteria for the fire water tanks' interior coating that include:
  - Indications of peeling and delamination are not acceptable.
  - Blisters are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including limitations, if any, identified in RG 1.54 on a particular standard. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections (e.g., reference ASTM D714-02, "Standard Test Method for Evaluating Degree of Blistering of Paints").
  - Indications such as cracking, flaking, and rusting are to be evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including limitations, if any, identified in RG 1.54 on a particular standard.

    - As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements.

    - Quantify the ability of the coating adhesion to meet the plant-specific design requirements specific to the coating/lining substrate for the fire water tanks based on visual inspections, wet sponge testing, or dry film testing.

- Revise Fire Water System Program procedures to include acceptance criteria of no abnormal debris (i.e., no corrosion products that could impede flow or cause downstream components to become clogged). Any signs of abnormal corrosion or blockage will be removed, its source and extent of condition determined and corrected, and entered into the corrective action program.

- Revise Fire Water System Program procedures to specify replacement of any sprinkler heads that show signs of leakage, excessive loading, corrosion, or loss of fluid in the glass bulb heat responsive element.

- Revise Fire Water System Program procedures to perform an obstruction evaluation if any of the following conditions exist:

    - There is an excessive discharge of material during routine flow tests.

    - An inspector's test valve is clogged during routine testing.

    - Foreign materials are identified during internal inspections.

    - Sprinkler heads are found clogged during removal or testing.

    - Pin hole leaks are identified in fire water piping.

    - After an extended fire water system shutdown (greater than one year).

    - There is a 50% increase in time it takes for water to flow out the inspector test valve after the associated dry valve is tripped when compared to the original acceptance criteria or last test.

- Revise Fire Water System Program procedures to evaluate for MIC if tubercules or slime are identified during any internal inspections of fire water piping.

Enhancements will be implemented prior to the period of extended operation.

A.1.14 Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion (FAC) Program manages loss of material due to wall thinning caused by FAC for carbon steel piping and components through (a) performing an analysis to determine systems susceptible to FAC, (b) conducting appropriate analysis to predict wall thinning, (c) performing wall thickness measurements based on wall thinning predictions and operating experience, and (d) evaluating measurement results to determine the remaining service life and the need for replacement or repair of components. The program relies on implementation of guidelines published by EPRI in NSAC-202L and on internal and external operating experience.

The program also manages wall thinning due to various erosion mechanisms in treated water and steam systems for all materials that may be identified through industry or plant-specific operating experience.

The Flow-Accelerated Corrosion Program will be enhanced as follows.

- Revise Flow-Accelerated Corrosion Program procedures to (1) manage wall thinning due to erosion mechanisms from cavitation, flashing, liquid droplet impingement, and solid particle impingement; (2) include susceptible locations based on the extent-of-condition reviews in response to plant-specific or industry operating experience, and EPRI TR-1011231, *Recommendations for Controlling Cavitation, Flashing, Liquid Droplet Impingement, and Solid Particle Erosion in Nuclear Power Plant Pipin*g, and NUREG/CR-6031, *Cavitation Guide for Control Valves*; (3) ensure piping and components replaced with FAC-resistant material and subject to erosive conditions are not excluded from inspections; and (4) include the need for continued wall thickness measurements of replaced piping until the effectiveness of the corrective action is assured.

- Revise Flow-Accelerated Corrosion Program procedures to evaluate wall thinning due to erosion from cavitation, flashing, liquid droplet impingement, and solid particle impingement when determining a replacement type of material.

Enhancements will be implemented prior to the period of extended operation.

A.1.15 Inservice Inspection Program

The Inservice Inspection Program manages cracking, loss of material, and reduction in fracture toughness for ASME Class 1, 2, and 3 pressure-retaining components including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting using periodic volumetric, surface, and visual examination and leakage testing of ASME Class 1, 2 and 3 components as specified in ASME Section XI code, 2001 Edition, 2003 addendum. Additional limitations, modifications and augmentations described in 10 CFR 50.55a are included as a part of this program. Every 10 years this program is updated to the latest ASME Section XI code edition and addendum approved by the NRC in 10 CFR 50.55a. Repair and replacement activities for these components are covered in Subsection IWA of the ASME code edition of record.

A.1.16 Inservice Inspection – IWF Program

The Inservice Inspection (ISI) – IWF Program performs periodic visual examinations of ASME Class 1, 2, and 3 piping and component supports to determine general mechanical and structural condition or degradation of component supports. The examinations include verification of clearances, settings and physical displacements and identification of loose or missing parts, debris, corrosion, wear, erosion, or the loss of integrity at welded or bolted connections. The ISI-IWF Program is implemented through plant procedures which provide administrative controls for the conduct of activities that are necessary to fulfill the requirements of ASME Section XI, as mandated by 10 CFR 50.55a. The monitoring methods are effective in detecting the applicable aging effects, and the frequency of monitoring provides reasonable assurance that significant degradation can be identified prior to a loss of intended function.

The ISI-IWF Program implementing procedures use recommendations delineated in NUREG-1339 and industry recommendations delineated in Electric Power Research Institute (EPRI) NP-5769, NP-5067 and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque.

The ISI-IWF Program will be enhanced as follows.

- Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting from Section 2 of Research Council on Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

- Revise plant procedures to specify that detection of aging effects will include monitoring anchor bolts for loss of material, loose or missing nuts and bolts, and cracking of concrete around the anchor bolts.

- Revise plant procedures to specify the following conditions as unacceptable:

  - Loss of material due to corrosion or wear, which reduces the load bearing capacity of the component support.

  - Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support.

  - Cracked or sheared bolts, including high strength bolts, and anchors.

Enhancements will be implemented prior to the period of extended operation.

A.1.17 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program performs periodic visual examinations and preventive maintenance to manage loss of material due to corrosion, loose bolting or rivets, and rail wear of cranes and hoists within the scope of license renewal and subject to aging management review, based on industry standards and guidance documents. The program includes structural components, including structural bolting, that make up the bridge, the trolley, and crane rails and includes cranes and hoists that meet the provisions of 10 CFR 54.4(a)(1) and (a)(2) and of NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants*. The activities entail visual examinations and functional testing to ensure that cranes and hoists are capable of sustaining their rated loads.

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will be enhanced as follows.

- Revise plant procedures to specify monitoring of crane rails for loss of material due to wear; monitoring structural components of the bridge, trolley and hoists for deformation, cracking, and loss of material due to corrosion; and monitoring structural connections for loose or missing bolts, nuts, pins or rivets and any other conditions indicative of loss of bolting integrity.

- Revise plant procedures to specify inspection frequency in accordance with ASME B30.2 or other appropriate standard in the ASME B30 series. Infrequently used cranes and hoists will be inspected prior to use. Bolted connections will be visually inspected for loose or missing bolts, nuts, pins or rivets at the same frequency as crane rails and structural components.

- Revise plant procedures to require that significant loss of material due to wear of crane rails and any sign of loss of bolting integrity will be evaluated in accordance with ASME B30.2 or other appropriate standard in the ASME B30 series.

- Revise plant procedures to specify that maintenance and repair activities will utilize the guidance provided in ASME B30.2 or other appropriate standard in the ASME B30 series.

Enhancements will be implemented prior to the period of extended operation.

A.1.18 Internal Surfaces in Miscellaneous Piping and Ducting Components Program

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material and reduction of heat transfer using representative sampling and opportunistic visual inspections of the internal surfaces of metallic and elastomeric components in environments of air–indoor (uncontrolled), air–outdoor, condensation, diesel exhaust, raw water, or waste water. Internal inspections will be performed during periodic system and component surveillances or during the performance of maintenance activities when the surfaces are accessible for visual inspection.

Where practical, the inspections will focus on the components most susceptible to aging because of time in service and severity of operating conditions. At a minimum, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) up to maximum of 25 components per population will be inspected. Opportunistic inspections will continue in each period even if the minimum sample size has been inspected.

For metallic components, visual inspection will be used to detect evidence of loss of material and reduction of heat transfer due to fouling. For non-metallic components, visual inspections and physical manipulation or pressurization will be used to detect evidence of surface irregularities. Visual examinations of elastomeric components will be accompanied by physical manipulation such that changes in material properties are readily observable. The sample size for physical manipulation will be at least 10 percent of accessible surface area.

Specific acceptance criteria are as follows:

- Stainless steel: clean surfaces, shiny, no abnormal surface condition.
- Metals: no abnormal surface condition.
- Elastomers: a uniform surface texture and color with no cracks, no unanticipated dimensional change, and no abnormal surface conditions.

Conditions that do not meet the acceptance criteria are entered into the corrective action program for evaluation. Any indications of relevant degradation will be evaluated using design standards, procedural requirements, current licensing basis, and industry codes or standards.

This program will be implemented prior to the period of extended operation.

A.1.19 <u>Masonry Wall Program</u>

The Masonry Wall Program is based on guidance provided in Information Notice (IN) 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to I.E. Bulletin 80-11." The program includes masonry walls within the scope of license renewal as delineated in 10 CFR 54.4. The program manages aging effects so that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation.

The program includes visual inspections of masonry walls that perform intended functions as defined in accordance with 10 CFR 54.4. Included are masonry walls required by 10 CFR 50.48, radiation shielding masonry walls, and masonry walls with the potential to affect safety-related components. The Structures Monitoring Program (Section A.1.38) manages the effects of aging on structural steel components, steel edge supports, and steel bracing of masonry walls.

Masonry walls are inspected at least once every 5 years to ensure there is no loss of intended function.

The Masonry Wall Program will be enhanced as follows.

- Revise plant procedures to ensure masonry walls located in in-scope structures are included in the scope of the Masonry Wall Program.
- Revise plant procedures to include monitoring gaps between the structural steel supports and masonry walls that could potentially affect wall qualification.
- Revise plant procedures to specify that masonry walls will be inspected at least once every 5 years with provisions for more frequent inspections in areas where significant aging effects (missing blocks, cracking, etc.) are observed to ensure there is no loss of intended function.
- Revise plant procedures to include acceptance criteria for masonry wall inspections that ensure observed aging effects (cracking, loss of material, or gaps between the structural steel supports and masonry walls) do not invalidate the wall's evaluation basis or impact its intended function.

Enhancements to this program will be implemented prior to the period of extended operation.

A.1.20 <u>Metal Enclosed Bus Inspection Program</u>

The Metal Enclosed Bus Inspection Program provides for the inspection of the internal and external portions of metal-enclosed bus (MEB) to identify age-related degradation of the bus and bus connections, the bus enclosure assemblies, and the bus insulation and insulators. The program will inspect the safety-related 4.16 kV MEBs (non-segregated) between switchgear 3A3-S and 3AB3-S and 3B3-S and the safety-related 480V MEBs (non-segregated) between 3A31-S and 3AB31-S and 3B31-S.

The program provides for the visual inspection of MEB internal surface (bus enclosure assemblies) to detect age-related degradation, including cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion. MEB insulating material is visually inspected for signs of reduced insulation resistance due to thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation, moisture/debris intrusion, or ohmic heating, as indicated by embrittlement, cracking, chipping, melting, swelling, discoloration, or surface contamination, which may indicate overheating or aging degradation. The internal bus insulating supports or insulators will be inspected for structural integrity and signs of cracks. MEB external surfaces are visually inspected for loss of material due to general, pitting, and crevice corrosion. Accessible elastomers (e.g., gaskets, boots, and sealants) are inspected for degradation, including surface cracking, crazing, scuffing, and changes in dimensions (e.g., "ballooning" and "necking"), shrinkage, discoloration, hardening, and loss of strength. A sample of accessible bolted connections will be inspected for increased resistance of connection by using thermography or by measuring connection resistance using a micro-ohmmeter. Thermography will be performed on bus connections with the MEB covers in place only if the bus enclosure is equipped with an infrared window to facilitate the inspection.

For accessible bolted connections, 20 percent of the population with a maximum sample of 25 will constitute a representative sample size. Otherwise, a technical justification of the methodology and sample size used for selecting components should be included as part of the program's site documentation. These inspections are performed at least once every 10 years.

As an alternative to thermography or measuring connection resistance of accessible bolted connections covered with heat shrink tape, sleeving, insulating boots, etc., visual inspection of insulation material may be used to detect surface anomalies, such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination. When this alternative visual inspection is used to check bolted connections, the first inspection is completed prior to the period of extended operation and at least once every 5 years thereafter.

This program will be used instead of the Structures Monitoring Program (Section A.1.38) for external surfaces of the bus enclosure assemblies.

This program will be implemented prior to the period of extended operation.

A.1.21 <u>Neutron-Absorbing Material Monitoring Program</u>

The Neutron-Absorbing Material Monitoring Program provides reasonable assurance that degradation of the neutron-absorbing material (Boral) used in spent fuel pools that could compromise the criticality analysis will be detected. The program relies on periodic inspection and testing to assure that the effects of aging do not cause degradation that impacts the required 5 percent sub-criticality margin through the period of extended operation. The program is established to monitor loss of material, reduction in neutron-absorbing capacity, and changes in dimension such as blisters, pits and bulges that could result in a loss of neutron absorbing capability. The parameters monitored include physical measurements and geometric changes in test coupons. The approach to relating measurement results from coupons to the condition of material in the spent fuel racks considers the exposure the coupons have received versus the exposure the spent fuel racks have received. In the event that there is a loss of neutron-absorbing capacity based on coupon testing, additional testing will be performed to ensure the sub-criticality requirements are met.

The Neutron-Absorbing Material Monitoring Program will be enhanced as follows:

- Revise Neutron Absorbing Material Monitoring Program procedures to compare measurements from periodic inspections to prior measurements, and relate coupon measurement results to the performance of the spent fuel neutron-absorber materials considering differences in exposure conditions, vented/non-vented test samples, spent fuel racks, etc. Ensure the predicted boron-10 areal density will be sufficient to maintain the subcritical conditions required by technical specifications until the next coupon test.

The inspection will be performed prior to the period of extended operation.

A.1.22 <u>Nickel Alloy Inspection Program</u>

The Nickel Alloy Inspection Program manages cracking due to primary water stress corrosion cracking (PWSCC) for nickel-alloy (600/82/182) components and loss of material due to boric acid-induced corrosion in susceptible safety-related components in the vicinity of nickel-alloy reactor coolant pressure boundary components as required by 10 CFR 50.55a. It provides (a) inspection requirements for the reactor coolant pressure boundary components that contain PWSCC-susceptible dissimilar metals (alloys 600/82/182) and (b) inspection requirements for reactor coolant pressure boundary components in the vicinity of PWSCC-susceptible dissimilar metals (Alloy 600/82/182).

The program monitors for reactor coolant pressure boundary cracking and leakage using various methods, including non-destructive examination techniques, radiation monitoring, and visual inspections for boric acid deposits or the presence of moisture to identify cracking in the reactor coolant pressure boundary or loss of material. Inspection methods, schedules and frequencies for susceptible components are implemented in accordance with 10 CFR 50.55a. Reactor coolant leakage is calculated and trended on a routine basis in accordance with technical specifications. The acceptance criteria for identified flaws and the methodology for evaluating the flaws are prescribed in 10 CFR 50.55a. Unacceptable indications of flaws are corrected through implementation of appropriate repair or replacement as dictated in 10 CFR 50.55a.

A.1.23 <u>Non-EQ Electrical Cable Connections Program</u>

The Non-EQ Electrical Cable Connections Program is a one-time inspection program that consists of a representative sample of electrical connections within the scope of license renewal, which is inspected or tested at least once prior to the period of extended operation to confirm that there are no aging effects requiring management during that period. Cable connections included in this program are those connections susceptible to age-related degradation resulting in increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation that are not subject to the environmental qualification requirements of 10 CFR 50.49.

Inspection methods may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation, such as heat shrink tape, sleeving, or insulating boots.

This program provides for one-time inspections that will be completed prior to the period of extended operation on a sample of connections. The factors considered for sample selection will be application (medium and low voltage, defined as < 35 kV), circuit loading (high loading), connection type, and location (high temperature, high humidity, vibration, etc.). The representative sample size will be 20 percent of the connection population with a maximum sample of 25.

The inspections will be performed prior to the period of extended operation.

A.1.24 Non-EQ Inaccessible Power Cables (>/= 400 V) Program

The Non-EQ Inaccessible Power Cables (≥ 400 V) Program will manage the aging effect of reduced insulation resistance on inaccessible power (≥ 400 V) cables that have a license renewal intended function.

The program provides for testing at least once every six years inaccessible or underground (e.g., in conduit, duct bank, or direct buried) power (≥ 400 volts) cables exposed to significant moisture to provide an indication of the condition of the conductor insulation, with the first tests occurring before the period of extended operation. The specific test should be a proven, commercially available test capable of detecting reduced insulation resistance of the cable's insulation system due to wetting or submergence. The condition of the cable insulation can be assessed with reasonable confidence using one or more of the following techniques: dielectric loss (dissipation factor/power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state-of-the-art at the time the tests are performed. One or more tests are used to determine the condition of the cables.

The program will include periodic inspections of manholes at least once every year (annually) to assess that cables and cable support structures are intact, but the inspection frequency will not be increased if water is found in the manholes during the inspections. In addition to the periodic manhole inspections, manhole inspections for water after event-driven occurrences, such as flooding, will be performed.

This program will be implemented prior to the period of extended operation.

A.1.25 Non-EQ Sensitive Instrumentation Circuits Test Review Program

The Non-EQ Sensitive Instrumentation Circuits Test Review Program manages the aging effects of the applicable cables in the following systems or sub-systems.

- Excore neutron flux monitoring system
- Radiation monitoring
  - Process monitoring system – component cooling water monitors
  - Area radiation monitoring system – channels 24–31
  - Area radiation monitoring system – high range containment area monitors
  - Area radiation system – fuel handling building
  - Airborne monitoring system – main control room monitors

The Non-EQ Sensitive Instrumentation Circuits Test Review Program provides reasonable assurance that the intended functions of sensitive, high-voltage, low-signal cables exposed to adverse localized equipment environments caused by heat, radiation and moisture (i.e., neutron flux monitoring instrumentation and process radiation monitoring) can be maintained consistent with the current licensing basis through the period of extended operation. Most sensitive instrumentation circuit cables and connections are included in the instrumentation loop calibration at the normal calibration frequency, which provides sufficient indication of the need for corrective actions based on acceptance criteria related to instrumentation loop performance. The review of calibration results or findings of surveillance testing programs will be performed once every 10 years, with the first review occurring before the period of extended operation.

For sensitive instrumentation circuit cables that are disconnected during instrument calibrations, testing using a proven method for detecting deterioration for the insulation system (such as insulation resistance tests or time domain reflectometry) will occur at least once every 10 years, with the first test occurring before the period of extended operation. Applicable industry standards and guidance documents are used to delineate the program.

This program will be implemented prior to the period of extended operation.

A.1.26 Non-EQ Insulated Cables and Connections Program

The Non-EQ Insulated Cables and Connections Program provides reasonable assurance the intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation and moisture can be maintained consistent with the current licensing basis through the period of extended operation. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the plant design environment for the cable or connection insulation materials.

The program consists of accessible insulated electrical cables and connections installed in adverse localized environments to be visually inspected at least once every 10 years for cable jacket and connection insulation surface anomalies, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination, that could indicate incipient conductor insulation aging degradation from temperature, radiation, or moisture.

This program will be implemented prior to the period of extended operation.

A.1.27 Oil Analysis Program

The Oil Analysis Program ensures that loss of material and reduction of heat transfer are not occurring by maintaining the quality of the lubricating oil. The program ensures that contaminants (primarily water and particulates) are within acceptable limits. Testing activities include sampling and analysis of lubricating oil for contaminants. Oil testing results that indicate the presence of water initiate corrective action that may include evaluating for in-leakage.

The One-Time Inspection Program uses inspections or non-destructive evaluations of representative samples to verify that the Oil Analysis Program has been effective at managing the aging effects of loss of material and reduction of heat transfer.

A.1.28 One-Time Inspection Program

The One-Time Inspection Program consists of a one-time inspection of selected components to accomplish the following:

- Verify the effectiveness of aging management programs designed to prevent or minimize the effects of aging to the extent that they will not cause the loss of intended function during the period of extended operation. The aging effects evaluated are loss of material, cracking, and reduction of heat transfer due to fouling.

- Confirm the insignificance of an aging effect for situations in which additional confirmation is appropriate using inspections that verify unacceptable degradation is not occurring.

- Trigger additional actions if necessary to ensure the intended functions of affected components are maintained during the period of extended operation.

The sample size will be 20 percent of the components in each material-environment-aging effect group up to a maximum of 25 components. Identification of inspection locations will be based on the potential for the aging effect to occur. Examination techniques will be established NDE methods with a demonstrated history of effectiveness in detecting the aging effect of concern, including visual, ultrasonic, and surface techniques. Acceptance criteria will be based on applicable ASME or other appropriate standards, design basis information, or vendor-specified requirements and recommendations. Any indication or relevant condition will be evaluated. The need for follow-up examinations will be evaluated based on inspection results.

The One-Time Inspection Program will not be used for structures or components with known age-related degradation mechanisms or when the environment in the period of extended operation is not expected to be equivalent to that in the prior 40 years.

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below.

Water Chemistry Control – Primary and Secondary Program	One-time inspection activity will verify the effectiveness of the Water Chemistry Control – Primary and Secondary Programs by confirming that unacceptable cracking, loss of material, and reduction of heat transfer is not occurring.

Oil Analysis Program	One-time inspection activity will verify the effectiveness of the Oil Analysis Program by confirming that unacceptable cracking, loss of material, and reduction of heat transfer is not occurring.
Diesel Fuel Monitoring Program	One-time inspection activity will verify the effectiveness of the Diesel Fuel Monitoring Program by confirming that unacceptable loss of material or reduction of heat transfer due to fouling is not occurring.
Reactor vessel flange leak detection line	One-time inspection activity will confirm that cracking and loss of material are not occurring or are so insignificant that a plant-specific aging management program is not warranted.
CW intake piping internals (reinforced concrete portions)	One-time inspection activity will confirm that change in material properties, loss of material, and cracking are not occurring or are so insignificant that a plant-specific aging management program is not warranted.

The inspections will be performed within the ten years prior to the period of extended operation.

A.1.29 <u>One-Time Inspection – Small-Bore Piping Program</u>

The One-Time Inspection – Small-Bore Piping Program augments ASME Code, Section XI requirements and is applicable to small-bore ASME Code Class 1 piping and components with a nominal pipe size diameter less than 4 inches (NPS < 4) and greater than or equal to NPS 1 in systems that have not experienced cracking of ASME Code Class 1 small-bore piping. The program can also be used for systems that have experienced cracking but have implemented design changes to effectively mitigate cracking.

The program provides a one-time volumetric or opportunistic destructive inspection of a 3 percent sample or maximum of 10 ASME Class 1 piping butt weld locations and a 3 percent sample or a maximum of 10 ASME Class 1 socket weld locations that are susceptible to cracking. Volumetric examinations are performed using a demonstrated technique that is capable of detecting the aging effects in the volume of interest. In the event the opportunity arises to perform a destructive examination of an ASME Class 1 small-bore weld that meets the susceptibility criteria, then the program takes credit for two volumetric examinations. The program includes pipes, fittings, branch connections, and full and partial penetration welds.

This program includes a sampling approach. Sample selection is based on susceptibility to stress corrosion, cyclic loading (including thermal, mechanical, and vibration fatigue), thermal stratification, thermal turbulence, dose considerations, operating experience, and limiting locations of total population of ASME Class 1 small-bore piping locations.

The program includes measures to verify that degradation is not occurring, thereby either confirming that there is no need to manage age-related degradation or validating the effectiveness of any existing program for the period of extended operation. If evidence of cracking is revealed by this one-time inspection, it will be entered into the corrective action program to determine extent of condition, and a follow-up periodic inspection will be managed by a plant-specific program.

The inspection will be performed within the six years prior to the period of extended operation.

A.1.30 Periodic Surveillance and Preventive Maintenance Program

The Periodic Surveillance and Preventive Maintenance (PSPM) Program manages aging effects not managed by other aging management programs, including change in material properties, cracking, loss of material, and reduction of heat transfer.

Inspections occur at least once every 5 years during the period of extended operation.

Credit for program activities has been taken in the aging management review of the following systems and structures.

- Inspect submersible sump pumps and backup pumps for dry cooling towers.
- Inspect emergency diesel generator system heat exchanger tubes.
- Inspect internal surface of stainless steel expansion joint in diesel exhaust.
- Inspect tubes and fins of the CCW dry cooling tower radiator.
- Inspect the internal surface of the portable UHS replenishment pump casing.
- Inspect the inside surface of RCP oil collection components (drip pans, enclosures, flame arrestors (tail pipe), piping, sight glass, tanks, and valve bodies).
- Inspect internal and external surfaces of control room HVAC portable smoke removal fan and smoke-ejector duct.
- Inspect the internal surface of a representative sample of abandoned equipment in the following nonsafety-related systems affecting safety-related systems:
    - Radiation monitoring (ARM, PRM)

- Auxiliary steam (AS)
- Blowdown (BD)
- Boron management (BM)
- Condensate (CD)
- Chemical feed (CF)
- Chilled water (CHW)
- Emergency diesel cooling (EG, EGA, EGC, EGF, EGL)
- Fuel pool cooling and purification (FS)
- Liquid waste management (LWM)
- Steam generator (SG)
- Solid waste management (SWM)
- Secondary sampling (SSL)

The PSPM Program will be enhanced as follows.

- Revise PSPM Program procedures as necessary to incorporate the activities denoted above.
- Revise the PSPM Program procedures to state that the acceptance criterion is no indication of relevant degradation and such indications will be evaluated.

Enhancements will be implemented prior to the period of extended operation.

A.1.31 <u>Protective Coating Monitoring and Maintenance Program</u>

The Protective Coating Monitoring and Maintenance Program manages the effects of aging on Service Level I coatings applied to external surfaces of carbon steel and concrete inside containment (e.g., steel containment vessel shell, structural steel, supports, penetrations, and concrete walls and floors). The program meets the technical basis of ASTM D 5163-08. The program provides an effective method to assess coating condition through visual inspections by identifying degraded or damaged coatings and providing a means for repair of identified problem areas.

Service Level I protective coatings are not credited to manage the effects of aging. Proper monitoring and maintenance of protective coatings inside containment ensures operability of post-accident safety systems that rely on water recycled through the containment. The proper monitoring and maintenance of Service Level I coatings ensures there is no coating degradation that would impact safety functions, for example, by clogging emergency core cooling system suction strainers.

The Protective Coating Monitoring and Maintenance Program will be enhanced as follows.

- Revise plant procedures to specify visual inspections of coatings near sumps or screens associated with the emergency core cooling system.

The enhancement will be implemented prior to the period of extended operation.

A.1.32 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program manages cracking and loss of material due to wear or corrosion for reactor head closure studs bolting (studs, washers, and nuts) using inservice inspection (ASME Section XI 2001 Edition 2003 Addendum Table IWB-2500-1) and preventive measures to mitigate cracking. Preventive actions include avoiding the use of metal-plated stud bolting, use of an acceptable surface treatment, use of stable lubricants, and use of bolting material that has actual yield strength of less than 150 ksi for all studs. The program detects cracks, loss of material and leakage using visual, surface and volumetric examinations as required by ASME Section XI. The program also relies on recommendations to address reactor head closure studs degradation listed in NUREG-1339 and NRC RG 1.65.

The Reactor Head Closure Studs Program will be enhanced as follows.

- Revise Reactor Head Closure Studs Program procedures to ensure that replacement studs are fabricated from bolting material with actual measured yield strength less than 150 kilo-pounds per square inch.

- Revise Reactor Head Closure Studs Program procedures to exclude the use of molybdenum disulfide (MoS_2) on the reactor vessel closure studs and refer to RG 1.65, Rev. 1.

Enhancements will be implemented prior to the period of extended operation.

A.1.33 Reactor Vessel Internals Program

The Reactor Vessel Internals Program implements the Electric Power Research Institute (EPRI) Technical Report N0. 1022863, “Materials Reliability Program: Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines” (MRP-227-A), and EPRI Technical Report No. 1016609, “Materials Reliability Program: Inspection Standard for PWR Internals”

(MRP-228), to manage the aging effects on the WF3 RVI components. WF3 is a CE Nuclear Steam Supply System (NSSS) design. The recommended activities in MRP-227-A and additional plant-specific activities not defined in MRP-227-A are implemented in accordance with Nuclear Energy Institute (NEI) 03-08, "Guideline for the Management of Materials Issues."

This program is used to manage cracking, loss of material due to wear, reduction in fracture toughness, change in dimension, and loss of preload for reactor vessel internal components intended to provide core support. The program applies the guidance in MRP-227-A for inspecting, evaluating and, if applicable, dispositioning non-conforming RVI components. The program includes expanding periodic examinations and other inspections, if the extent of the degradation identified exceeds the expected levels.

The sample selection process consisted of categorizing reactor vessel internal components into four sets: (1) a set of primary internals component locations for the WF3 RVI design that are expected to show leading indications of the degradation effects, (2) a set of expansion internals component locations that are specified to expand the sample should the indications be more severe than anticipated, (3) a set of internals locations that are deemed to be adequately managed by existing programs, such as American Society of Mechanical Engineers (ASME) Code Section XI Examination Category B-N-3, examinations of core support structures and (4) a set of internal locations that are deemed to require no additional measures. This process used appropriate component functionality criteria, age-related degradation susceptibility criteria, and failure consequences criteria to identify the components that will be inspected under the program. Consequently the sample selection process is adequate to assure that the intended functions of the reactor internal components are maintained during the period of extended operation.

The Reactor Vessel Internals Program will be enhanced as follows.

- Revise Reactor Vessel Internals Program procedures to include the inspections identified in the inspection plan in NRC submittal W3F1-2013-0070, dated December 16, 2013, including the inspection of the core stabilizing bolts as an addition to the WF3 ASME Section XI In-Service Inspection Program.

The enhancement will be implemented prior to the period of extended operation.

A.1.34 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program manages reduction of fracture toughness and long-term operating conditions for reactor vessel beltline materials using material data and dosimetry. The program includes all reactor vessel beltline materials as defined by 10 CFR 50 Appendix G, Section II.F, and complies with 10 CFR 50, Appendix H for vessel material surveillance.

The objective of the Reactor Vessel Surveillance Program is to provide sufficient material data and dosimetry to (a) monitor irradiation embrittlement at the end of the period of extended operation and (b) establish operating restrictions on the inlet temperature, neutron spectrum, and neutron flux after a surveillance capsule is withdrawn for testing. If surveillance capsules are not withdrawn during the period of extended operation, operating restrictions are specified to ensure that the plant is operated under the conditions to which the surveillance capsules were exposed. Capsules removed from the reactor vessel are tested and reported in accordance with ASTM E 185-82 to the extent practicable for the configuration of the specimens in the capsule.

A.1.35 <u>Selective Leaching Program</u>

The Selective Leaching Program demonstrates the absence of selective leaching in a selected sample of components (i.e., 20 percent of the population with maximum of 25 components) fabricated from gray cast iron and copper alloys (except for inhibited brass) that contain greater than 15 percent zinc or greater than 8 percent aluminum in an environment of condensation, raw water, waste water, treated water, or soil. A sample population is defined as components with the same material and environment combination. Where practical the sample population will focus on components most susceptible to aging due to time in service, severity of operating condition, and lowest design margin. The program will include a one-time visual inspection of selected components coupled with hardness measurement or other mechanical examination techniques such as destructive testing, scraping or chipping to determine whether loss of material is occurring due to selective leaching that may affect the ability of a component to perform its intended function during the period of extended operation.

For buried components with coatings no selective leaching inspections are necessary where coating degradation has not been identified. For buried components with degraded coating or no coatings, the sample size is 20 percent of the population up to a maximum of 25 components. If only minor coating damage has been identified, the sample size may be reduced to 5 percent of the population with a maximum of 6 components. Minor coating degradation is defined as (a) there were no more than 2 instances of degradation identified in the 10-year period prior to the period of extended operation, and (b) the pipe could be shown to meet unreinforced opening criteria of the applicable piping code when assuming the pipe surface affected by the coating degradation is a through-wall hole.

Follow-up of unacceptable inspection findings includes an evaluation using the corrective action program and possible expansion of the inspection sample size and location.

This inspections will be performed within the 5 years prior to the period of extended operation.

A.1.36 <u>Service Water Integrity Program</u>

The Service Water Integrity Program manages loss of material and reduction of heat transfer for components fabricated from materials such as carbon steel, copper alloy, gray cast iron, or stainless steel, and in an environment of raw water as described in the WF3 response to NRC GL 89-13. The program includes (a) surveillance and control techniques to manage effects of biofouling, corrosion, erosion, and silting; (b) tests to verify heat transfer capability of heat exchangers important to safety; (c) system walkdowns to ensure compliance with the licensing basis; (d) routine inspections and maintenance; and (e) review of maintenance, operating and training practices and procedures.

The Service Water Integrity Program will be enhanced as follows.

- Revise the Service Water Integrity Program procedures to (1) flush redundant, infrequently flowed sections, and stagnant lines to ensure there is no blockage, and (2) inspect selected low flow or stagnant areas and system low points such as drains.

- Revise Service Water Integrity Program procedures to monitor the ACCW basins for biological fouling by visual inspection as well as analysis of water for biological activity.

Enhancements will be implemented prior to the period of extended operation.

A.1.37 Steam Generator Integrity Program

The Steam Generator Integrity Program manages aging effects for the steam generator tubes, plugs, sleeves, and secondary side components contained within the steam generator in accordance with the plant technical specifications and commitments to NEI 97-06. Preventive and mitigative measures include foreign material exclusion programs and other primary and secondary side maintenance activities, such as sludge lancing and inspecting any installed plugs and replacing them when needed with updated materials as needed. The program has acceptance criteria for when a tube should be plugged based on wall thickness measurements.

Steam generator water chemistry is monitored and maintained in accordance with the Water Chemistry Control – Primary and Secondary Program. The thermally treated Alloy 690 tubes are monitored for wear based on industry experience using inspection techniques capable of detecting the aging effect. The general conditions of components (e.g., plugs when installed, sleeves, and other secondary side components) are monitored visually. In the event degradation is noted, the corrective action program drives a more detailed inspection. The inspections are performed by qualified personnel using qualified techniques in accordance with approved station procedures. In addition primary-to-secondary leak rates are monitored as a potential indicator of steam generator tube integrity. Condition monitoring assessments are performed and documented in accordance with site-approved procedures to confirm that adequate tube integrity has been maintained since the previous inspection. Operational assessments are performed to ensure the tube integrity will be maintained until the next scheduled inspection. The acceptance criteria are in accordance with technical specifications.

A.1.38 Structures Monitoring Program

The Structures Monitoring Program manages the effects of aging on structures and structural components, including structural bolting, within the scope of license renewal. The program was developed based on guidance in RG 1.160, Revision 2, "Monitoring the Effectiveness of

Maintenance at Nuclear Power Plants," and NUMARC 93-01, Revision 2, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," to satisfy the requirement of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The scope of the Structures Monitoring Program includes structures within the scope of license renewal as delineated in 10 CFR 54.4. The program performs periodic visual examinations to monitor the condition of structures and structural components, including components such as concrete and steel components, structural bolting, component supports, and concrete masonry blocks. Inspections are performed at least once every 5 years to ensure there is no loss of intended function between inspections.

The Structures Monitoring Program includes plant procedures that use the guidance delineated in NUREG-1339 and industry recommendations delineated in Electric Power Research Institute (EPRI) NP-5769, NP-5067 and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque.

The Structures Monitoring Program will be enhanced as follows.

- Revise plant procedures to include the following in-scope structures.
    - Battery house 230kV switchyard
    - Control house 230kV switchyard
    - Fire pump house
    - Fire water storage tank foundations
    - Fuel oil storage tank foundation
    - Manholes, handholes and duct banks
    - Plant stack
    - Transformer and switchyard support structures and foundations
- Revise plant procedures to include a list of structural components and commodities within the scope of the program.
- Revise plant procedures to include periodic sampling and chemical analysis of ground water.
- Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852, and/or ASTM A490 bolting from Section 2 of Research Council on

Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

- Revise plant procedures to include the following parameters to be monitored or inspected:
  - For concrete structures, base inspections on quantitative requirements of industry codes, standards and guidelines (e.g., ASCE 11, ACI 349.3R) and consideration of industry and plant-specific operating experience.
  - For concrete structures and components include loss of material, loss of bond, increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation.
  - For chemical analysis of ground water, monitor pH, chlorides and sulfates.
- Revise plant procedures to include the following components to be monitored for the associated parameters:
  - Anchor bolts (nuts and bolts) for loss of material, and loose or missing nuts and/or bolts.
  - Elastomeric vibration isolators and structural sealants for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening).
- Revise plant procedures to include the following:
  - Visual inspection of elastomeric material should be supplemented by feel or touch to detect hardening if the intended function of the elastomeric material is suspect. Include instructions to augment the visual examination of elastomeric material with physical manipulation of at least 10 percent of available surface area.
  - Structures will be inspected at least once every 5 years with provisions for more frequent inspections of structures and components categorized as (a)(1) in accordance with 10 CFR 50.65.
  - Submerged structures will be inspected at least once every 5 years.
  - Sampling and chemical analysis of ground water at least once every 5 years. The program owner will review the results and evaluate any anomalies and perform trending of the results.

Enhancements will be implemented prior to the period of extended operation.

A.1.39 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program manages reduction in fracture toughness and cracking. The program consists of a determination of the susceptibility of CASS piping, piping components, and piping elements to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. For potentially susceptible components aging management is accomplished through qualified visual inspections, such as enhanced visual examination, qualified ultrasonic testing methodology, or component-specific flaw tolerance evaluation in accordance with ASME Section XI code, 2001 Edition 2003 addendum. Applicable industry standards and guidance documents are used to delineate the program.

This program will be implemented prior to the period of extended operation.

A.1.40 Water Chemistry Control – Closed Treated Water Systems Program

The Water Chemistry Control – Closed Treated Water Systems Program manages loss of material, cracking, and reduction of heat transfer in components exposed to a treated water environment through monitoring and control of water chemistry, including the use of corrosion inhibitors, chemical testing, and visual inspections of internal surface condition. The EPRI Closed Cycle Cooling Guideline (1007820), industry and in-house operating experience, and vendor recommendations are used to delineate the program.

The Water Chemistry Control – Closed Treated Water Systems Program will be enhanced as follows.

- Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to include high pressure fire water diesel pump jacket water system.

- Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to specify water chemistry parameters monitored and the acceptable range of values for these parameters that are in accordance with EPRI 1007820, industry guidance, or vendor recommendations.

- Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to inspect accessible components whenever a closed treated water system boundary is opened. Ensure that a representative sample of piping and components is inspected at a frequency of at least every 10 years. These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection guidance by qualified personnel using procedures that are capable of detecting corrosion, fouling, or cracking. If visual examination identifies adverse conditions, additional examinations, including ultrasonic testing, are conducted.

- Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to define a representative sample as 20 percent of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. Components inspected will be those with the highest likelihood of corrosion, fouling, or cracking.

- Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to perform treated water sampling and analysis of the closed treated water systems per industry standards and in no case greater than quarterly unless justified with an additional analysis.

- Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to specify water chemistry parameters monitored and the acceptable range of values for these parameters that are in accordance with EPRI 1007820, industry guidance, or vendor recommendations.

- Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to provide acceptance criteria for inspections. Ensure system components meet system design requirements, such as minimum wall thickness.

Enhancements will be implemented prior to the period of extended operation.

A.1.41 <u>Water Chemistry Control – Primary and Secondary Program</u>

The Water Chemistry Control – Primary and Secondary Program manages loss of material, cracking, and reduction of heat transfer in components in an environment of treated water through periodic monitoring and control of water chemistry. The Water Chemistry Control – Primary and Secondary Program monitors and controls water chemistry parameters such as pH, chloride, fluoride, and sulfate o keep peak levels of various contaminants below system specific limits. EPRI Report 1014986, Rev. 6, is used to provide guidance for primary water chemistry, and EPRI Report 1016555, Rev. 7, is used to provide guidance for secondary water chemistry.

The One-Time Inspection Program (Section A.1.28) uses inspections or nondestructive evaluations of representative samples to verify that the Water Chemistry Control – Primary and Secondary Program has been effective at managing aging effects. The representative sample includes low flow and stagnant areas.

A.2 EVALUATION OF TIME-LIMITED AGING ANALYSES

In accordance with 10 CFR 54.21(c), an application for a renewed license requires an evaluation of time-limited aging analyses for the period of extended operation. The following time-limited aging analyses were evaluated as part of the license renewal application to meet this requirement.

A.2.1 Reactor Vessel Neutron Embrittlement

The regulations governing reactor vessel integrity are in 10 CFR 50. Section 50.60 requires that light-water reactors meet the fracture toughness, pressure-temperature limits, and material surveillance program requirements for the reactor coolant pressure boundary set forth in Appendices G and H of 10 CFR 50. Based on the plant operating history, 55 EFPY is used to bound the expected EFPY.

A.2.1.1 Reactor Vessel Fluence

Fluence is calculated based on a time-limited assumption defined by the operating term. Therefore, analyses that evaluate reactor vessel neutron embrittlement based on calculated fluence are TLAAs. The neutron fluence values for the WF3 reactor pressure vessel beltline and extended beltline materials (plates and welds) have been projected to 55 EFPY of operation.

The methods used to calculate the WF3 vessel fluence satisfy the criteria set forth in RG 1.190, "Calculational and Dosimetry Methods for Determining Pressure Vessel Neutron Fluence." These methods have been approved by the NRC and are described in detail in WCAP-14040-A, Revision 4, and WCAP-16083-NP-A, Revision 0.

FSAR Section 5.3.1.6 provides additional information on reactor pressure vessel specimen capsules and associated dosimeters. WCAP-18002-NP, July 2015, includes the results of capsules withdrawn and tested for WF3, corresponding to end of cycles 4, 11, and 19. See Section A.1.34 for additional information on the Reactor Vessel Surveillance Program.

The calculation of fluence is treated as a TLAA that has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii) and used as an input to the analyses in the following sections.

A.2.1.2 Upper-Shelf Energy

For the license renewal application, upper-shelf energy (USE) was evaluated for all materials included in the beltline. Fracture toughness criteria in 10 CFR 50 Appendix G requires that beltline materials maintain USE no less than 50 ft-lb during operation of the reactor. The 55 EFPY USE values for the beltline materials were determined using methods consistent with RG 1.99, Revision 2, “Radiation Embrittlement of Reactor Vessel Materials.” The value of peak ¼T fluence is used.

Two methods can be used to predict the decrease in USE with irradiation, depending on the availability of credible surveillance capsule data as defined in RG 1.99. For vessel beltline materials that are not in the surveillance program or for locations with non-credible data, the Charpy USE is assumed to decrease as a function of fluence and copper content, as indicated in RG 1.99, Revision 2 (Position 1.2). When two or more credible surveillance data sets are available from the reactor, they may be used to determine the Charpy USE of the surveillance material. The surveillance data are then used in conjunction with the regulatory guide to predict the change in USE of the reactor vessel material due to irradiation (Position 2.2).

The 55 EFPY Position 1.2 USE values of the vessel materials can be predicted using the corresponding ¼T fluence projection, the copper content of the materials, and Figure 2 in RG 1.99, Revision 2. The predicted Position 2.2 USE values are determined for the reactor vessel materials that are contained in the surveillance program by using the plant surveillance data along with the corresponding ¼T fluence projection.

All of the beltline materials in the WF3 reactor vessel are projected to remain no less than the USE limit of 50 ft-lb (per 10 CFR 50 Appendix G) through 55 EFPY. Therefore, the WF3 reactor vessel Charpy USE TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.1.3 Pressurized Thermal Shock

10 CFR 50.61 provides rules for protection against pressurized thermal shock events for pressurized water reactors. Licensees are required to perform an assessment of the projected values of reference temperature whenever a significant change occurs in projected values of the adjusted reference temperature for pressurized thermal shock (RT_{PTS}), or upon request for a change in the expiration date for the operation of the facility. Section 10 CFR 50.61 provides screening criteria as acceptable if RT_{PTS} is lower than 270°F for plates, forgings, and axial welds and RT_{PTS} is lower than 300°F for circumferential welds.

Section 10 CFR 50.61(c) provides two methods for determining RT_{PTS}. Position 1 applies for material that does not have surveillance data available, and Position 2 applies for material with surveillance data. Positions 1 and 2 are described in RG 1.99, Revision 2. Adjusted reference temperatures are calculated for both Positions 1 and 2 by following the guidance in RG 1.99, Sections 1.1 and 2.1, respectively, using copper and nickel content of beltline materials and end-of-life fluence projections.

The beltline materials in the WF3 reactor vessel is below the RT_{PTS} screening criteria values of 270°F for plates, forgings, and axial welds and 300°F for circumferentially oriented welds through 55 EFPY. Therefore, the WF3 reactor vessel RT_{PTS} TLAA has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.1.4 Pressure-Temperature Limits

Appendix G of 10 CFR 50 requires operation of the reactor pressure vessel within established pressure-temperature (P-T) limits. These limits are established by calculations that utilize the materials and fluence data obtained through the Reactor Vessel Surveillance Program (Section A.1.34). The P-T limits are calculated for several years into the future and remain valid for an established period of time. The provisions of 10 CFR 50 Appendix G require the P-T limit curves be maintained and updated as necessary.

The WF3 P-T limits for the reactor coolant system are described in Technical Specifications (TS) 3.4.8.1. TS Figure 3.4-2, Reactor Coolant System Pressure-Temperature Limits, identifies the current WF3 heatup curve. TS Figure 3.4-3, Reactor Coolant System Pressure-Temperature Limits, identifies the current WF3 cooldown curve. The analyses used to determine P-T limit curves are considered TLAAs. The WF3 P-T limit curves included in the Technical Specifications are valid through 32 EFPY. Prior to exceeding 32 EFPY, WF3 will generate new P-T limit curves to support plant operation beyond 32 EFPY.

TS 4.4.8.1.2 states the reactor vessel material irradiation surveillance specimens shall be removed and examined to determine changes in material properties, at the intervals required by 10 CFR Part 50 Appendix H in accordance with the reactor vessel material surveillance program withdrawal schedule in FSAR Table 5.3-10. The results of these examinations shall be used to update TS Figures 3.4-2 and 3.4-3. Surveillance specimen capsule 83° was removed at 24.66 EFPY and analysis results were provided in March 2015.

The WF3 P-T limit curves will be updated, as 10 CFR 50 Appendix G requires, through the period of extended operation in conjunction with the Reactor Vessel Surveillance Program (Section A.1.34). Therefore, P-T limit curves TLAAs will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.1.5 Low Temperature Overpressure Protection (LTOP) Setpoints

The WF3 Technical Specification bases state that an operating shutdown cooling loop, connected to the RCS, provides overpressure relief capability and will prevent RCS overpressurization. This is accomplished by an LTOP relief valve located in each shutdown cooling loop, as identified in FSAR Section 5.2B.3. In addition, the overpressure protection system provides a diverse means of protection against RCS overpressurization at low temperatures.

Each time the P-T limit curves are revised, the LTOP relief setpoints are reevaluated. Therefore, the LTOP limits are considered part of the calculation analyses of P-T curves. The P-T limit curves are updated prior to exceeding applicable EFPY limits. See Section A.2.1.4 for further information on the P-T limit curves.

Therefore, the effects of aging associated with the LTOP setpoints TLAA will be adequately managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2 Metal Fatigue

Fatigue analyses are considered TLAAs for Class 1 and non-Class 1 mechanical components. Fatigue is an age-related degradation mechanism caused by cyclic stressing of a component by either mechanical or thermal stresses.

The aging management reviews that were performed for license renewal identify mechanical components that are within the scope of license renewal and are subject to aging management review. When TLAA – metal fatigue is identified in the aging management program column of the tables in Section 3 of the license renewal application, the associated fatigue analyses are evaluated in this section. Evaluation of TLAAs per 10 CFR 54.21(c)(1) determines whether

(i) The analyses remain valid for the period of extended operation,

(ii) The analyses have been projected to the end of the period of extend operation, or

(iii) The effects of aging on the intended function(s) will be adequately managed for the period of extended operation.

Documentation of the evaluation of Class 1 component fatigue analyses is provided in Section A.2.2.1. Fatigue analysis of non-Class 1 mechanical components is discussed in Section A.2.2.2. Screening for environmentally adjusted fatigue effects is documented in Section A.2.2.3.

A.2.2.1 Class 1 Metal Fatigue

Fatigue evaluations performed in the design of WF3 Class 1 components in accordance with ASME Section III requirements are contained in the equipment stress reports and associated analyses. The fatigue evaluations calculate a cumulative usage factor (CUF) for each component or subassembly based on a specified number of design cycles for that component. Because the design cycles may be the number of transient cycles that were assumed for a 40-year license term, these calculations of CUFs are considered TLAAs.

Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications established the initial set of transients that were used in the design of the components and are included as part of each component stress report. FSAR Table 3.9-1 “Transients Used in Stress Analysis of Code Class 1 Components” lists the transients that were used for the stress analyses of the RCS components. FSAR Table 3.9-3, “Transients and Operative Conditions for Code Class 1 Non-NSSS Piping,” identifies the transients that were used as input to the piping stress analyses. Some component specific locations such as the pressurizer and safety injection nozzles were also analyzed for design transients beyond the original set of transients in response to thermal stratification and component specific stresses that are identified in the individual stress analyses.

The WF3 Technical Requirements Manual TRM 5.7-1 lists the requirement to maintain the reactor coolant system components within the component cyclic or transient limits. WF3 will manage the aging effects due to fatigue of these components using the Fatigue Monitoring Program in accordance with 10 CFR 54.21(1)(c)(iii). The WF3 Fatigue Monitoring Program monitors transient cycles that contribute to fatigue usage and is further described in FSAR Section A.1.11.

Reactor Vessel

FSAR Table 5.2-1, "Codes and Addenda Applied to Reactor Coolant Pressure Boundary," identifies the codes and addenda applied to the reactor vessel. The reactor vessel was designed to ASME Section III, Class 1 through Summer 1971 Addenda.

The original reactor vessel head has been replaced. The replacement reactor vessel head was designed to ASME Section III, Class 1 1998 edition through 2000 addenda.

WF3 will monitor transient cycles using the Fatigue Monitoring Program (Section A.1.11) and assure that corrective action specified in the program is taken if any of the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor vessel in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Vessel Internals

The WF3 reactor vessel internals are not pressure boundary components since they are internal to the reactor vessel. As described in the FSAR Section 3.9.5, in the design of critical reactor vessel internals components which are subject to fatigue, the stress analysis was performed utilizing the design fatigue curve of Figure I-9.2 of Section III of the ASME Boiler and Pressure Vessel Code. Stress reports were generated for several specific reactor vessel internals locations to support component replacement or reanalysis.

WF3 will monitor transient cycles using the Fatigue Monitoring Program (Section A.1.11) and assure that corrective action specified in the program is taken if any of the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor vessel internals in accordance with 10 CFR 54.21(c)(1)(iii).

Pressurizer

The pressurizer is described in FSAR Section 5.4.10 and is shown in Figure 5.4-6. As identified in FSAR Table 5.2-1, the pressurizer was designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, through Summer 1971 Addenda. Structural weld overlays have been installed on the pressurizer surge nozzle, the pressurizer safety valve nozzles, and the pressurizer spray nozzle. The heater sleeves that remain in service were repaired. The pressurizer side shell temperature measurement nozzle and upper and lower head instrument nozzles were replaced.

The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the pressurizer in accordance with 10 CFR 54.21(c)(1)(iii).

Steam Generators

Replacement steam generators have been installed at WF3 as identified in FSAR Section 5.4.2 and shown in Figure 5.4-5. As identified in FSAR Table 5.2-1, the replacement steam generators were designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, 1998 Edition through 2000 Addenda. In addition to the RCS transients identified in FSAR Section 3.9.1.1, the replacement steam generators fatigue analysis included evaluation of component specific transients such as the tube leak tests.

The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the steam generators in accordance with 10 CFR 54.21(c)(1)(iii).

Control Element Drive Mechanisms

As described in FSAR Section 4.1, the control element drive mechanisms have been replaced. The control element drive mechanisms are described in FSAR Sections 3.9.4 and 4.1 and shown in FSAR Figure 3.9-13. As described in FSAR Table 5.2-1, the replacement control element drive mechanisms are designed to ASME Boiler and Pressure Vessel Code, Section III, Nuclear Power Plant Components, Class 1, 1998 Edition and 2000 Addenda.

The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the control element drive mechanisms in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Coolant Pumps

The reactor coolant pumps are described in FSAR Sections 3.9.1 and 5.4.1 and are shown in FSAR Figures 5.4-1 and 5.4-2. As identified in FSAR Table 5.2-1, the pump casings were designed to ASME Boiler and Pressure Vessel Code, Section III, Class 1, through Winter 1971 Addenda.

The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the reactor coolant pumps in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Coolant System Class 1 Piping

The hot legs, cold legs and pressurizer surge piping was supplied by the nuclear steam system supplier (NSSS), ABB Combustion Engineering, and controlled by project specifications. The

Class 1 tributary lines analyses include consideration of location specific transients such as loss of charging and loss of letdown.

Structural weld overlays (SWOL) have been installed on piping for the hot leg surge nozzle, hot leg 2 inch drains, and the hot leg shutdown cooling nozzles.

The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the reactor coolant system Class 1 piping in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.2 Non-Class 1 Metal Fatigue

Non-Class 1 Pressure Boundary Piping Using Stress Range Reduction Factors

The impact of thermal cycles on non-Class 1 piping and in-line components is reflected in the calculation of the allowable stress range. The design of ASME III Code Class 2 and 3 or B31.1 piping systems incorporates a stress range reduction factor for determining acceptability of piping design with respect to thermal stresses. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7000 thermal cycles. The allowable stress range is reduced by the stress range reduction factor if the number of thermal cycles exceeds 7000 (ASME Boiler and Pressure Vessel Code, Division 1, Subsection NC, Class 2 Components). For the systems that are subjected to elevated temperatures above the fatigue threshold, thermal cycles have been projected for 60 years of plant operation for the piping and in-line components. These projections indicate that 7000 thermal cycles will not be exceeded for 60 years of operation. Therefore, the non-Class 1 pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Flexible Connections and Expansion Joints

As part of the review of the WF3 documentation for fatigue, a search was performed for analyses of mechanical flexible connectors and expansion joints that were identified during the aging management review process. TLAAs were identified for emergency diesel generator intake air and exhaust expansion joints. The review of these analyses determined these flexible connectors were qualified for more cycles than are expected through the period of extended operation. The design analyses were determined to remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Non-Class 1 Heat Exchangers with Fatigue Analysis

Although the letdown and regenerative heat exchangers are in the Class 2 portion of the system, a fatigue analysis was completed for these components. The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the letdown and regenerative heat exchangers in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.3 Effects of Reactor Water Environment on Fatigue Life

Industry test data indicate that certain environmental effects (such as temperature and dissolved oxygen content) in the primary systems of light water reactors could result in greater susceptibility to fatigue than would be predicted by fatigue analyses based on the ASME Section III design fatigue curves. The ASME design fatigue curves were based on laboratory tests in air and at low temperatures. Although the failure curves derived from laboratory tests were adjusted to account for effects such as data scatter, size effect, and surface finish, these adjustments may not be sufficient to account for actual plant operating environments.

As reported in SECY-95-245, the NRC believes that no immediate staff or licensee action is necessary to deal with the environmentally assisted fatigue issue. In addition, the staff concluded that it could not justify requiring a backfit of the environmental fatigue data to operating plants. However, the NRC concluded that, because metal fatigue effects increase with service life, environmentally assisted fatigue should be evaluated for any proposed extended period of operation for license renewal.

NUREG-1801, Section X.M1 says the applicant “addresses the effects of the coolant environment on component fatigue life by assessing the impact of the reactor coolant environment on a sample of critical components for the plant”. There is no analysis of environmentally assisted fatigue (EAF) under the current licensing basis. Rather, the effect on fatigue life of the reactor water environment is a new consideration for license renewal. Applying the F_{en}s is not required during the initial 40 years of operation, consistent with the closure of Generic Safety Issue (GSI) 190. The full EAF evaluation will be completed for WF3 by reanalysis prior to the period of extended operation as identified by the enhancement to the Fatigue Monitoring Program (Section A.1.11).

Original design basis fatigue calculations typically include conservatism meant to simplify the analyses, such as lumping all transients together and considering them all to be as severe as the worst transient for a particular location. As a part of incorporating the effects on fatigue of the reactor water environment, the design basis fatigue analyses may be revised for locations that would exceed a CUF of 1.0. CUFs will be determined using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case).

WF3 will update the fatigue usage calculations using refined fatigue analyses to determine valid CUFs less than 1.0 when accounting for the effects of reactor water environment prior to the period of extended operation. This includes applying the appropriate F_{en} factors to valid CUFs determined using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case). WF3 will review design basis ASME Class 1 component fatigue evaluations to ensure the locations evaluated for the effects of the reactor coolant environment on fatigue include the most limiting components within the reactor coolant pressure boundary. Environmental effects on fatigue for these critical components will be evaluated using one of the following sets of formulae.

Carbon and Low Alloy Steels

- Those provided in NUREG/CR-6583, using the applicable ASME Section III fatigue design curve.
- Those provided in Appendix A of NUREG/CR-6909, using either the applicable ASME Section III fatigue design curve or the fatigue design curve for carbon and low alloy steel provided in NUREG/CR-6909 (Figures A.1 and A.2, respectively, and Table A.1).
- A staff-approved alternative.

Austenitic Stainless Steels

- Those provided in NUREG/CR-5704, using the applicable ASME Section III fatigue design curve.
- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).
- A staff-approved alternative.

Nickel Alloys

- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).
- A staff-approved alternative.

If an acceptable CUF cannot be calculated, WF3 will repair or replace the affected locations before exceeding an environmentally adjusted CUF of 1.0.

Therefore, WF3 will manage the effects of fatigue, including environmentally assisted fatigue, under the Fatigue Monitoring Program (Section A.1.11) for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.3 Environmental Qualification of Electrical Components

All operating plants must meet the requirements of 10 CFR 50.49, which defines the scope of electrical components to be included in an EQ program and also sets forth requirements for EQ programs. Qualification is established for the environmental and service conditions expected for normal plant operation and also those conditions postulated for plant accidents. A record of qualification for in-scope components must be prepared and maintained in auditable form. Equipment qualification evaluations for EQ components that result in a qualification of at least 40 years, but less than 60 years, are considered TLAAs for license renewal.

The WF3 Environmental Qualification of Electric Components Program (EQ Program, Section A.1.9) manages component thermal, radiation, and cyclical aging, as applicable, through aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components not qualified for the current license term are to be refurbished, replaced, or have their qualification extended prior to reaching the aging limits established in the evaluation. The WF3 EQ Program ensures that the EQ components are maintained in accordance with their qualification bases.

The WF3 EQ Program was established to meet WF3 commitments for 10 CFR 50.49. The program is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components." The WF3 EQ Program will manage the effects of aging on the intended function(s) of EQ components that are the subject of EQ TLAAs for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.4 Containment Liner Plate, Metal Containments, and Penetrations Fatigue Analysis

As identified in FSAR Section 3.8.2.3, the containment vessel was designed to exhibit a general elastic behavior under accident and earthquake conditions of loading. No permanent deformations due to primary stresses have been permitted in the design under any condition of loading. A fatigue evaluation was not performed for the containment vessel design.

WF3 has penetration bellows that are reviewed as part of the structural aging management reviews. As described in FSAR Section 3.6.2.4, these bellows are designed for a minimum of 7000 thermal cycles and 200 design seismic movements (cycles). The calculated allowable cycles were in excess of the required 7000 cycles. This number of cycles is more than these expansion joints will experience through the period of extended operation. The analyses remain valid in accordance with 10 CFR 54.21(c)(1)(i).

A.2.5 Other Plant-Specific TLAAs

A.2.5.1 Crane Load Cycles Analysis

Cranes that were designed to Crane Manufacturer's Association of America Specification #70 (CMAA-70) have cycles specified as part of their design analysis. While there is no analysis that involves time-limited assumptions defined by the current operating term, for example, 40 years, crane cycle limits are nevertheless evaluated as a TLAA for cranes that were designed to CMAA-70.

A review of the cranes at WF3 was performed to determine which cranes were designed to CMAA-70. CMAA-70 (1975 Edition) Table 3.3.3.1.3-1 identifies crane service classes with the corresponding range of loading cycles. The allowable range of loading cycles considered is up to 100,000 load cycles for a CMAA-70 Service Class A1 crane.

The expected number of applicable crane cycles is below the top of the lowest cyclic loading range in CMAA-70 of 100,000 cycles, and the associated TLAAs remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.5.2 Leak-Before-Break Analysis

FSAR Section 3.6.3 identifies that the leak before break (LBB) analysis is used to eliminate from the structural design bases the dynamic effects of double-ended guillotine breaks and equivalent longitudinal breaks. LBB analyses consider the thermal aging of cast austenitic stainless steel (CASS) piping and fatigue transients that drive the flaw growth during plant operation. Because these two analysis considerations could involve time-limited assumptions defined by the current term of operation, LBB analyses were further reviewed as potential TLAAs for WF3.

LBB analyses consider the thermal aging of the CASS piping and fatigue transients that drive flaw growth during operation of the plant. Because these two analysis considerations could be defined by the current term of operation, LBB analyses were further reviewed as potential TLAAs for WF3 main coolant loop and the pressurizer surge line components.

Thermal Aging of CASS

Thermal aging results in an increase in the yield strength of CASS and a decrease in fracture toughness, the decrease being proportional to the level of ferrite in the material. Thermal aging in these stainless steels will continue until the saturation, or fully aged, point is reached. Bounding fracture toughness values were used in the evaluation for the main coolant loop pump safe ends and the pressurizer surge line components. Since LBB evaluations use saturated (fully aged) fracture toughness properties, the evaluation of the thermal aging of CASS portion of the analysis does not have a material property time-dependency and is not a TLAA.

Fatigue Crack Growth

The other LBB analysis consideration that could be time-limited is the accumulation of fatigue transient cycles that could invalidate the fatigue crack growth analysis. The LBB analysis determined that fatigue crack growth effects will be very small when analyzing for the full set of design transients. The basis of the evaluation of fatigue crack growth effects in the LBB analysis will remain unchanged so long as the number of transient occurrences remains below the number assumed for the analysis of fatigue crack growth effects. A review of applicable analyses identified the fatigue crack growth analysis is a TLAA. Therefore, the effects of aging associated with the leak before break (LBB) fatigue crack growth analyses for the main coolant loops and pressurizer surge line piping will be managed by the Fatigue Monitoring Program (Section A.1.11) for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.5.3 High Energy Line Break Postulation

As described in FSAR Section 3.6.2.1.1.2, ASME Section III, Code Class 1 piping (excluding RCS loop and surge piping) rupture locations have been postulated in any piping run or branch at terminal ends and other intermediate points in accordance with RG 1.46, Protection Against Pipe Whip Inside Containment (May 1973) and Branch Technical Position MEB 3-1 issued with

Generic Letter 87-11, Relaxation in Arbitrary Intermediate Pipe Rupture Requirements. Postulated rupture locations for Class 1 piping are as follows:

(1) Terminal points

(2) Any intermediate points between terminal ends where the CUF exceeds 0.1 (based upon normal and upset plant conditions and OBE).

(3) Any intermediate points between terminal ends where the primary plus secondary stress intensities derived on an elastic basis is greater than 2.0 S_m in ferritic and 2.4 S_m in austenitic piping materials (based on normal and upset plant conditions and OBE).

The fatigue analysis to determine a CUF for the intermediate points is considered a TLAA. The Fatigue Monitoring Program (Section A.1.11) identifies when the transients affecting high-energy piping systems are approaching their analyzed number of cycles. Therefore, the CUF calculations used to determine HELB postulated break locations are TLAAs that will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.5.4 Reactor Vessel Internal Evaluations (Other than Fatigue)

During service, reactor vessel internal (RVI) and core support component materials are exposed to a high-temperature aqueous environment, fast neutron irradiation, and applied loads. WF3 evaluated the effect of extended power uprate (EPU) conditions on the potential for degradation of RVI component materials. The evaluation addressed age-related degradation mechanisms of materials that could be affected by the reactor coolant temperature and by neutron and gamma irradiation. The evaluations found that neutron and gamma flux are lower than considered in the original design. Therefore, the level of irradiation-induced embrittlement was not expected to change significantly with the uprate. Also, embrittlement of CASS components as a result of thermal aging and neutron irradiation was not significantly affected by the power uprate. However, extended power uprate evaluations to determine the effects of fluence on RVI components are considered TLAAs because they were based on operation through the original 40-year operating term.

The WF3 Reactor Vessel Internals Program (Section A.1.33) will manage the effects of aging associated with RVI TLAAs for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.3 REFERENCES

A.3-1 [WF3 License Renewal Application—later]

A.3-2 [NRC Safety Evaluation Report for WF3 License Renewal—later]

A.4 LICENSE RENEWAL COMMITMENT LIST

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
1	Bolting Integrity	Enhance the Bolting Integrity Program as described in LRA Section B.1.1.	Prior to June 18, 2024	W3F1-2016-0012
2	Buried and Underground Piping and Tanks Inspection	Implement the Buried and Underground Piping and Tanks Inspection Program as described in LRA Section B.1.3.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
3	Coating Integrity	Implement the Coating Integrity Program as described in LRA Section B.1.4.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
4	Compressed Air Monitoring	Enhance the Compressed Air Monitoring Program as described in LRA Section B.1.5.	Prior to June 18, 2024	W3F1-2016-0012
5	Containment Inservice Inspection–IWE	Enhance the CII-IWE Program as described in LRA Section B.1.6.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later	W3F1-2016-0012
6	Diesel Fuel Monitoring	Enhance the Diesel Fuel Monitoring Program as described in LRA Section B.1.8.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later	W3F1-2016-0012

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
7	External Surfaces Monitoring	Enhance the External Surfaces Monitoring Program as described in LRA Section B.1.10.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
8	Fatigue Monitoring	Enhance the Fatigue Monitoring Program as described in LRA Section B.1.11.	Enhancement to develop a set of fatigue usage calculations: prior to December 18, 2022. Remaining two enhancements: prior to June 18, 2024.	W3F1-2016-0012
9	Fire Protection	Enhance the Fire Protection Program as described in LRA Section B.1.12.	Prior to June 18, 2024	W3F1-2016-0012
10	Fire Water System	Enhance the Fire Water System Program as described in LRA Section B.1.13.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
11	Flow-Accelerated Corrosion	Enhance the Flow-Accelerated Corrosion Program as described in LRA Section B.1.14.	Prior to June 18, 2024	W3F1-2016-0012
12	Inservice Inspection - IWF	Enhance the ISI-IWF Program as described in LRA Section B.1.16.	Prior to June 18, 2024	W3F1-2016-0012

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
13	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Enhance the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program as described in LRA Section B.1.17.	Prior to June 18, 2024	W3F1-2016-0012
14	Internal Surfaces in Miscellaneous Piping and Ducting Components	Implement the Internal Surfaces in Miscellaneous Piping and Ducting Components Program as described in LRA Section B.1.18.	Prior to June 18, 2024	W3F1-2016-0012
15	Masonry Wall	Enhance the Masonry Wall Program as described in LRA Section B.1.19.	Prior to June 18, 2024	W3F1-2016-0012
16	Metal Enclosed Bus Inspection	Implement the Metal Enclosed Bus Inspection Program as described in LRA Section B.1.20	Prior to June 18, 2024	W3F1-2016-0012
17	Neutron-Absorbing Material Monitoring	Enhance the Neutron-Absorbing Material Monitoring Program as described in LRA Section B.1.21.	Prior to June 18, 2024	W3F1-2016-0012
18	Non-EQ Electrical Cable Connections	Implement the Non-EQ Electrical Cable Connections Program as described in LRA Section B.1.23.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
19	Non-EQ Inaccessible Power Cables (≥ 400 V)	Implement the Non-EQ Inaccessible Power Cables (≥ 400 V) Program as described in LRA Section B.1.24.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
20	Non-EQ Sensitive Instrumentation Circuits Test Review	Implement the Non-EQ Sensitive Instrumentation Circuits Test Review Program as described in LRA Section B.1.25.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
21	Non-EQ Insulated Cables and Connections	Implement the Non-EQ Insulated Cables and Connections Program as described in LRA Section B.1.26.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
22	One-Time Inspection	Implement the One-Time Inspection Program as described in LRA Section B.1.28.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
23	One-Time Inspection – Small-Bore Piping	Implement the One-Time Inspection – Small-Bore Piping Program as described in LRA Section B.1.29.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
24	Periodic Surveillance and Preventive Maintenance	Enhance the PSPM Program as described in LRA Section B.1.30.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
25	Protective Coating Monitoring and Maintenance	Enhance the Protective Coating Monitoring and Maintenance Program as described in LRA Section B.1.31.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
26	Reactor Head Closure Studs	Enhance the Reactor Head Closure Studs Program as described in LRA Section B.1.32.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
27	Reactor Vessel Internals	Enhance the Reactor Vessel Internals Program as described in LRA Section B.1.33.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
28	Selective Leaching	Implement the Selective Leaching Program as described in LRA Section B.1.35.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
29	Service Water Integrity	Enhance the Service Water Integrity Program as described in LRA Section B.1.36.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012

No.	Program or Activity	Commitment	Implementation Schedule	Source (Letter Number)
30	Structures Monitoring	Enhance the Structures Monitoring Program as described in LRA Section B.1.38.	Prior to June 18, 2024, or the end of the last refueling outage prior to December 18, 2024, whichever is later.	W3F1-2016-0012
31	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel	Implement the Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program as described in LRA Section B.1.39.	Prior to June 18, 2024.	W3F1-2016-0012
32	Water Chemistry Control – Closed Treated Water Systems	Enhance the Water Chemistry Control – Closed Treated Water Systems Program as described in LRA Section B.1.40.	Prior to June 18, 2024.	W3F1-2016-0012

Appendix B

Aging Management Programs and Activities

Waterford Steam Electric Station, Unit 3
License Renewal Application

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B.0 INTRODUCTION

B.0.1 OVERVIEW

The aging management review results for the integrated plant assessment of Waterford Steam Electric Station, Unit 3 (WF3) are presented in Sections 3.1 through 3.6 of this application. The programs credited in the integrated plant assessment for managing the effects of aging are described in this appendix.

Each aging management program is described in this appendix in terms of the 10 elements discussed in NUREG-1800 (Ref. B.2-1) Appendix A.1, "Aging Management Review – Generic," Table A.1-1, "Elements of an Aging Management Program for License Renewal." For aging management programs that are comparable to the programs described in Sections X and XI of NUREG-1801 (Ref. B.2-2), *Generic Aging Lessons Learned (GALL) Report*, the 10 elements have been compared to the elements of the NUREG-1801 program. For plant-specific programs without a comparable NUREG-1801 program, the 10 elements are included in the program description.

B.0.2 FORMAT OF PRESENTATION

For those aging management programs that are comparable to the programs described in Sections X and XI of NUREG-1801, the program discussion is presented in the following format.

- **Program Description**: abstract of the overall program.
- **NUREG-1801 Consistency**: summary of the consistency between the WF3 program and the corresponding NUREG-1801 program, when applicable.
- **Exceptions to NUREG-1801**: exceptions to the NUREG-1801 program, including a justification for the exceptions (when applicable).
- **Enhancements**: future program enhancements with a proposed schedule for their completion (when applicable).
- **Operating Experience**: discussion of operating experience information specific to the program.
- **Conclusion**: statement of reasonable assurance that the program is effective, or will be effective, once implemented with necessary enhancements.

For plant-specific programs, a complete description is provided in terms of the 10 elements of NUREG-1800, Table A.1-1.

B.0.3 CORRECTIVE ACTIONS, CONFIRMATION PROCESS AND ADMINISTRATIVE CONTROLS

Three elements common to all aging management programs are corrective actions, confirmation process, and administrative controls. Discussion of these elements is presented below. Corrective actions have program-specific details which are included in the descriptions of the individual programs in this report, but further discussion of the confirmation process and administrative controls is not included in the descriptions of the individual programs.

Corrective Actions

WF3 quality assurance (QA) procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. Conditions adverse to quality, such as failures, malfunctions, deviations, defective material and equipment, and nonconformances, are promptly identified and corrected. In the case of significant conditions adverse to quality, measures are implemented to ensure that the cause of the nonconformance is determined and that corrective action is taken to preclude recurrence. The root cause of the significant condition adverse to quality and the corrective action implemented are documented and reported to appropriate levels of management. The corrective action controls of the WF3 (10 CFR Part 50, Appendix B) quality assurance program are applicable to all aging management programs and activities through the period of extended operation.

Confirmation Process

WF3 QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The WF3 Quality Assurance Program applies to WF3 safety-related structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished in accordance with the established WF3 corrective action program and document control program. The confirmation process is part of the corrective action program and includes the following:

- Reviews to assure that corrective actions are adequate.
- Tracking and reporting of open corrective actions.
- Review of corrective action effectiveness.

Any follow-up inspection required by the confirmation process is documented in accordance with the corrective action program. The corrective action program constitutes the confirmation process for aging management programs and activities. The WF3 confirmation process is consistent with NUREG-1801.

Administrative Controls

WF3 QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The WF3 Quality Assurance Program applies to WF3 safety-related structures and components. Administrative (document) control for both safety-related and nonsafety-related structures and components is accomplished per the existing document control program. The WF3 administrative controls are consistent with NUREG-1801.

B.0.4 OPERATING EXPERIENCE

Operating experience for the programs and activities credited with managing the effects of aging was reviewed. The operating experience review included a review of corrective actions resulting in program enhancements. For inspection programs, reports of recent inspections, examinations, or tests were reviewed to determine if aging effects have been identified on applicable components. For monitoring programs, reports of sample results were reviewed to determine if parameters are being maintained within program specifications. Also, program owners contributed evidence of program success or weakness and identified applicable self-assessments, QA audits, peer evaluations, and NRC reviews.

Operating experience from plant-specific and industry sources is identified and systematically reviewed on an ongoing basis. The WF3 corrective action program, which is implemented in accordance with the quality assurance program, effects the documentation and evaluation of plant-specific operating experience. The WF3 operating experience program, which meets the provisions of NUREG-0737, Item I.C.5, “Procedures for Feedback of Operating Experience to Plant Staff,” systematically evaluates industry operating experience. The operating experience program includes active participation in the Institute of Nuclear Power Operations' operating experience program, as endorsed by the NRC.

In accordance with these programs, site-specific and industry operating experience items are screened to determine whether they involve lessons learned that may impact aging management programs (AMPs). Items are evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined that the effects of aging are not adequately managed. Plant-specific operating experience associated with managing the effects of aging is reported to the industry in accordance with guidelines established in the operating experience review program.

Training provided for personnel responsible for submitting, screening, assigning, evaluating, or otherwise processing plant-specific and industry operating experience, as well as for personnel responsible for implementing AMPs, is based on the complexity of the job performance requirements and assigned responsibilities. Training is scheduled on a recurring basis, which accommodates the turnover of plant personnel and the need for new training content.

B.0.5 AGING MANAGEMENT PROGRAMS

Table B-1 lists the aging management programs described in this appendix. Programs are identified as either existing or new. The programs are either comparable to programs described in NUREG-1801 or are plant-specific. The correlation between NUREG-1801 programs and WF3 programs is shown in Table B-2.

Table B-1
Aging Management Programs

Program	Section	New or Existing
Bolting Integrity	B.1.1	Existing
Boric Acid Corrosion	B.1.2	Existing
Buried and Underground Piping and Tanks Inspection	B.1.3	New
Coating Integrity	B.1.4	New
Compressed Air Monitoring	B.1.5	Existing
Containment Inservice Inspection – IWE	B.1.6	Existing
Containment Leak Rate	B.1.7	Existing
Diesel Fuel Monitoring	B.1.8	Existing
Environmental Qualification (EQ) of Electric Components	B.1.9	Existing
External Surfaces Monitoring	B.1.10	Existing
Fatigue Monitoring	B.1.11	Existing
Fire Protection	B.1.12	Existing
Fire Water System	B.1.13	Existing
Flow-Accelerated Corrosion	B.1.14	Existing
Inservice Inspection	B.1.15	Existing
Inservice Inspection – IWF	B.1.16	Existing
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B.1.17	Existing

Table B-1 (Continued)
Aging Management Programs

Program	Section	New or Existing
Internal Surfaces in Miscellaneous Piping and Ducting Components	B.1.18	New
Masonry Wall	B.1.19	Existing
Metal Enclosed Bus Inspection	B.1.20	New
Neutron-Absorbing Material Monitoring	B.1.21	Existing
Nickel Alloy Inspection	B.1.22	Existing
Non-EQ Electrical Cable Connections	B.1.23	New
Non-EQ Inaccessible Power Cable (≥ 400 V)	B.1.24	New
Non-EQ Sensitive Instrumentation Circuits Test Review	B.1.25	New
Non-EQ Insulated Cables and Connections	B.1.26	New
Oil Analysis	B.1.27	Existing
One-Time Inspection	B.1.28	New
One-Time Inspection – Small-Bore Piping	B.1.29	New
Periodic Surveillance and Preventive Maintenance	B.1.30	Existing
Protective Coating Monitoring and Maintenance	B.1.31	Existing
Reactor Head Closure Studs	B.1.32	Existing
Reactor Vessel Internals	B.1.33	Existing
Reactor Vessel Surveillance	B.1.34	Existing
Selective Leaching	B.1.35	New
Service Water Integrity	B.1.36	Existing
Steam Generator Integrity	B.1.37	Existing
Structures Monitoring	B.1.38	Existing

Table B-1 (Continued)
Aging Management Programs

Program	Section	New or Existing
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.1.39	New
Water Chemistry Control – Closed Treated Water Systems	B.1.40	Existing
Water Chemistry Control – Primary and Secondary	B.1.41	Existing

B.0.6 CORRELATION WITH NUREG-1801 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 programs and WF3 programs is shown below. For the WF3 programs, links to appropriate sections of this appendix are provided.

Table B-2
WF3 AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	WF3 Program
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) of Electric Components [B.1.9]
X.M1	Fatigue Monitoring	Fatigue Monitoring [B.1.11]
X.S1	Concrete Containment Tendon Prestress	WF3 does not have pre-stressed tendons in the containment structure. This NUREG-1801 program does not apply.
XI.M1	ASME [American Society of Mechanical Engineers] Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Inservice Inspection [B.1.15]
XI.M2	Water Chemistry	Water Chemistry Control – Primary and Secondary [B.1.41]
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Studs [B.1.32]

Table B-2 (Continued)
WF3 AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	WF3 Program
XI.M4	BWR Vessel ID [Inside Diameter] Attachment Welds	WF3 is a PWR. This BWR program does not apply.
XI.M5	BWR Feedwater Nozzle	WF3 is a PWR. This BWR program does not apply.
XI.M6	BWR Control Rod Drive Return Line Nozzle	WF3 is a PWR. This BWR program does not apply.
XI.M7	BWR Stress Corrosion Cracking	WF3 is a PWR. This BWR program does not apply.
XI.M8	BWR Penetrations	WF3 is a PWR. This BWR program does not apply.
XI.M9	BWR Vessel Internals	WF3 is a PWR. This BWR program does not apply.
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion [B.1.2]
XI.M11B	Cracking of Nickel-Alloy Components and Loss of Material Due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components (PWRs only)	Nickel Alloy Inspection [B.1.22]
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) [B.1.39]
XI.M16A	PWR Vessel Internals	Reactor Vessel Internals [B.1.33].
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion [B.1.14]
XI.M18	Bolting Integrity	Bolting Integrity [B.1.1]
XI.M19	Steam Generators	Steam Generator Integrity [B.1.37]
XI.M20	Open-Cycle Cooling Water System	Service Water Integrity [B.1.36]

Table B-2 (Continued)
WF3 AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	WF3 Program
XI.M21A	Closed Treated Water Systems	Water Chemistry Control – Closed Treated Water Systems [B.1.40]
XI.M22	Boraflex Monitoring	WF3 does not use Boraflex in the spent fuel pool storage racks. This NUREG-1801 program does not apply.
XI.M23	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems [B.1.17].
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring [B.1.5]
XI.M25	BWR Reactor Water Cleanup System	WF3 is a PWR. This BWR program does not apply.
XI.M26	Fire Protection	Fire Protection [B.1.12]
XI.M27	Fire Water System	Fire Water System [B.1.13]
XI.M29	Aboveground Metallic Tanks	Not credited for aging management. The only outdoor tank constructed on soil or concrete in the scope of license renewal is the fire water storage tank. There are no indoor tanks with a capacity greater than 100,000 gallons.
XI.M30	Fuel Oil Chemistry	Diesel Fuel Monitoring [B.1.8]
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance [B.1.34]
XI.M32	One-Time Inspection	One-Time Inspection [B.1.28]
XI.M33	Selective Leaching	Selective Leaching [B.1.35]
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection – Small-Bore Piping [B.1.29]
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring [B.1.10]

Table B-2 (Continued)
WF3 AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	WF3 Program
XI.M37	Flux Thimble Tube Inspection	The Combustion Engineering designed reactor vessel does not use bottom mounted instrument flux thimble tubes.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Internal Surfaces in Miscellaneous Piping and Ducting Components [B.1.18]
XI.M39	Lubricating Oil Analysis	Oil Analysis [B.1.27]
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex	Neutron-Absorbing Material Monitoring [B.1.21]
XI.M41	Buried and Underground Piping and Tanks	Buried and Underground Piping [B.1.3]
XI.M42	Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks	Coating Integrity [B.1.4]
XI.E1	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Insulated Cables and Connections [B.1.26]
XI.E2	Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits	Non-EQ Sensitive Instrumentation Circuits Test Review [B.1.25]
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Power Cables ($\leq$ 400 V) [B.1.24]
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus Inspection [B.1.20]

Table B-2 (Continued)
WF3 AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	WF3 Program
XI.E5	Fuse Holders	Not credited for aging management. Refer to relevant discussion in Table 3.6.1, Items 3.6.1-16 and 3.6.1-17.
XI.E6	Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Electrical Cable Connections [B.1.23]
XI.S1	ASME Section XI, Subsection IWE	Containment Inservice Inspection – IWE [B.1.6]
XI.S2	ASME Section XI, Subsection IWL	The only portion of containment that is classified as Class CC equivalent is the concrete base slab, which is inaccessible and is exempted from examination in accordance with IWL-1220(b). WF3 does not have a concrete containment that requires an IWL program.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection – IWF [B.1.16]
XI.S4	10 CFR 50, Appendix J	Containment Leak Rate [B.1.7]
XI.S5	Masonry Walls	Masonry Wall [B.1.19]
XI.S6	Structures Monitoring	Structures Monitoring [B.1.38]

Table B-2 (Continued)
WF3 AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	WF3 Program
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	WF3 is not committed to the requirements of NRC RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," and does not have conventional water-control structures, such as an intake structure. Structures associated with the ultimate heat sink are part of the nuclear plant island structure and managed by the Structures Monitoring Program. Therefore, WF3 does not have this program.
XI.S8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program [B.1.31]
Plant-Specific Program		
NA	Plant-specific program	Periodic Surveillance and Preventive Maintenance [B.1.30]

Table B-3 compares WF3 programs with NUREG-1801 programs.

Table B-3
WF3 Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison	
		Program has Enhancements	Program has Exceptions to NUREG-1801
Bolting Integrity [B.1.1]		X	X
Boric Acid Corrosion [B.1.2]			
Buried and Underground Piping [B.1.3]			
Coating Integrity [B.1.4]			X
Compressed Air Monitoring [B.1.5]		X	
Containment Inservice Inspection – IWE [B.1.6]		X	
Containment Leak Rate [B.1.7]			
Diesel Fuel Monitoring [B.1.8]		X	
Environmental Qualification (EQ) of Electric Components [B.1.9]			
External Surfaces Monitoring [B.1.10]		X	
Fatigue Monitoring [B.1.11]		X	
Fire Protection [B.1.12]		X	
Fire Water System [B.1.13]		X	X
Flow-Accelerated Corrosion [B.1.14]		X	
Inservice Inspection [B.1.15]			
Inservice Inspection – IWF [B.1.16]		X	
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems [B.1.17]		X	

Table B-3
WF3 Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison	
		Program has Enhancements	Program has Exceptions to NUREG-1801
Internal Surfaces in Miscellaneous Piping and Ducting Components [B.1.18]			
Masonry Wall [B.1.19]		X	
Metal Enclosed Bus Inspection [B.1.20]			
Neutron-Absorbing Material Monitoring [B.1.21]		X	
Nickel Alloy Inspection [B.1.22]			
Non-EQ Electrical Cable Connections [B.1.23]			
Non-EQ Inaccessible Power Cables (≥ 400 V) [B.1.24]			X
Non-EQ Sensitive Instrumentation Circuits Test Review [B.1.25]			
Non-EQ Insulated Cables and Connections [B.1.26]			
Oil Analysis [B.1.27]			
One-Time Inspection [B.1.28]			
One-Time Inspection – Small-Bore Piping [B.1.29]			
Periodic Surveillance and Preventive Maintenance [B.1.30]	X		
Protective Coating Monitoring and Maintenance [B.1.31]		X	
Reactor Head Closure Studs [B.1.32]		X	
Reactor Vessel Internals [B.1.33]		X	

Table B-3
WF3 Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison	
		Program has Enhancements	Program has Exceptions to NUREG-1801
Reactor Vessel Surveillance [B.1.34]			
Selective Leaching [B.1.35]			
Service Water Integrity [B.1.36]		X	
Steam Generator Integrity [B.1.37]			
Structures Monitoring [B.1.38]		X	
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) [B.1.39]			
Water Chemistry Control – Closed Treated Water Systems [B.1.40]		X	
Water Chemistry Control – Primary and Secondary [B.1.41]			

B.1 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

B.1.1 BOLTING INTEGRITY

Program Description

The Bolting Integrity Program manages loss of preload, cracking, and loss of material for pressure-retaining closure bolting using preventive measures and inspection activities. The Reactor Head Closure Stud Program (Section B.1.32) manages the aging effects on the reactor head closure studs, and the Structures Monitoring Program (Section B.1.38) manages the aging effects on structural bolting. Preventive measures include material selection (e.g., use of materials with an actual yield strength of less than 150 kilo-pounds per square inch [ksi]), lubricant selection (e.g., restricting the use of molybdenum disulfide), applying the appropriate preload (torque), and checking for uniformity of gasket compression where appropriate to preclude loss of preload, loss of material, and cracking. This program supplements the inspection activities required by ASME Section XI for ASME Class 1, 2 and 3 pressure-retaining bolting. For ASME Class 1, 2 and 3 bolting, and non-ASME Code class bolts, periodic system inspections (at least once per refueling cycle) ensure identification of indications of loss of preload, cracking, and loss of material before leakage becomes excessive. Applicable industry standards and guidance documents, including NUREG-1339, EPRI NP-5769, and EPRI TR-104213, were used to develop the program implementing procedures.

The preventive measures of the Bolting Integrity Program manage loss of preload for buried fire water system bolting, which is inspected under the Buried and Underground Piping and Tanks Inspection Program (Section B.1.3).

NUREG-1801 Consistency

The Bolting Integrity Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M18, Bolting Integrity, with the following exception.

Exceptions to NUREG-1801

The Bolting Integrity Program has the following exception.

Element Affected	Exception
4. Detection of Aging Effects	NUREG-1801 recommends periodic inspections of bolting for leakage, loss of preload and cracking. Periodic inspections are not performed for buried fire water system bolting.[1]

1. The Bolting Integrity Program manages loss of preload for buried fire water system bolting using preventive measures implemented before burial, specifically, verifying correct material, checking for uniform gasket compression after assembly, applying protective coating, and applying an appropriate preload. These measures have proven effective in managing loss of preload for buried fire water system bolting. Inspection of buried fire water system bolting is performed in accordance with the Buried and Underground Piping and Tanks Inspection Program.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise Bolting Integrity Program procedures to include submerged pressure-retaining bolting.
3. Parameters Monitored or Inspected	Revise Bolting Integrity Program procedures to monitor high-strength bolting locations (i.e., bolting with actual yield strength greater than or equal to 150 ksi) for cracking.
4. Detection of Aging Effects	Revise Bolting Integrity Program procedures to include a volumetric examination per ASME Code Section XI, Table IWB-2500-1, for high-strength closure bolting with actual yield strength greater than or equal to 150 ksi regardless of code classification.

Operating Experience

The following operating experience provides objective evidence that the Bolting Integrity Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In 2009, during visual examination of pressurizer manway studs, thread damage was discovered on two of seven studs. The damaged studs were replaced prior to reinstalling the manway.

- In 2009, eighteen waste gas compressor inlet isolation valve bolts were found with evidence of loss of material. The cause was not specified in the documentation; however, identification of the condition indicates that the visual inspections performed as part of the Bolting Integrity Program are effective at identifying indications prior to loss of intended function. All bolts and nuts were replaced and torqued in accordance with technical manual instructions.

During the review of plant-specific operating experience, few conditions were found involving significant degradation of component bolting. The absence of adverse operating experience with Waterford 3 bolting is further indication that the program has been effective.

As discussed in element 10 of NUREG-1801, Section XI.M18, this program considers the technical information and industry operating experience provided in NRC IE Bulletin 82-02 and NRC Generic Letter (GL) 91-17.

The identification of degradation and initiation of corrective action prior to loss of intended function provides reasonable assurance that the Bolting Integrity Program will remain effective. The application of proven methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Bolting Integrity Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.2 BORIC ACID CORROSION

Program Description

The Boric Acid Corrosion Program manages loss of material and increase in connection resistance for components on which borated water may leak. The program includes (a) visual inspection of external surfaces that are potentially in an environment of borated water leakage, including mechanical, electrical and structural components; (b) timely identification of leak path and removal of boric acid residues; (c) assessment of degradation due to corrosion, if any; and (d) follow-up inspection for adequacy. This program was implemented in response to NRC GL 88-05 and industry operating experience.

The program provides systematic measures to identify borated water leakage and ensure that corrosion caused by leaking borated water does not lead to unacceptable degradation of the leakage source or adjacent structures or components. Visual inspections are performed to identify boric acid deposits, discoloration, staining, and moisture in areas of borated water leakage. If evidence of leakage is identified, the necessary actions are taken to determine the exact location and cause of the leakage. When leakage is discovered by other activities (normal plant walkdowns, maintenance, etc.), the Boric Acid Corrosion Program provides for evaluations and assessments to identify and correct boric acid leakage before loss of intended function of affected components. These corrective actions include modifications to equipment design or operating procedures to reduce the probability of boric acid leakage at locations where such leaks may cause corrosion damage.

NUREG-1801 Consistency

The Boric Acid Corrosion Program is consistent with the program described in NUREG-1801, Section XI.M10, Boric Acid Corrosion.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Boric Acid Corrosion Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- A review of the program health report completed in 2014 indicates the program is effectively identifying, prioritizing and resolving boric acid leakage conditions. Successful identification and correction of conditions prior to loss of intended function are evidence of program effectiveness.
- In 2013, evidence of a boric acid leak was identified on a pressurizer normal spray control valve at the body to bonnet connection. Corrective action was taken to repack the valve, replace the bonnet gasket, and clean the borated water residue. Subsequent inspections confirmed the condition was corrected.
- In 2014, dry white boric acid residue was discovered around the pipe cap of a containment spray header vent valve. Investigation confirmed that this was not an active leak. No carbon steel was impacted, and there was no impact on the pressure boundary.
- During a 2015 boric acid inspection, evidence of borated water leakage was found around a pipe cap and on the floor below a high pressure injection flow control valve downstream drain. The leak did not appear active, and no material degradation was noted. There was no impact to pressure boundary.
- In 2015, boric acid accumulation was discovered on a high pressure safety injection pump casing. The boric acid was dry and white with no sign of an active leak. The boric acid did not degrade the pump pressure boundary or impact pump or system operability.

As discussed in element 10 to NUREG-1801, Section XI.M10, this program considers the technical information and industry operating experience provided in NRC IN 86-108, IN 2003-02, and NRC Bulletin 2002-01.

The identification of borated water leakage and initiation of corrective action prior to loss of intended function provides reasonable assurance that the Boric Acid Corrosion Program will remain effective for managing loss of material and increase in connection resistance. The application of proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Boric Acid Corrosion Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.3 BURIED AND UNDERGROUND PIPING AND TANKS INSPECTION

Program Description

The Buried and Underground Piping and Tanks Inspection Program is a new program that will manage the effects of aging on external surfaces of buried piping components subject to aging management review. There are no buried tanks subject to aging management review. Components included in the program are fabricated from metallic or concrete materials. The program will manage loss of material and cracking through preventive, mitigative (e.g., coatings, backfill quality, and cathodic protection), and periodic inspection activities. Program activities include verification of effective cathodic protection, non-destructive evaluation of pipe wall thickness, hydrostatic testing of piping, and visual inspection of the exterior of buried piping, fire hydrant and valve body components as permitted by opportunistic and directed excavations.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Buried and Underground Piping and Tanks Inspection Program will be consistent with the program described in NUREG-1801, Section XI.M41, “Buried and Underground Piping and Tanks,” as modified by LR-ISG-2011-03, “Changes to the Generic Aging Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, ‘Buried and Underground Piping and Tanks.’”

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following discussion provides objective evidence that the Buried and Underground Piping and Tanks Inspection Program, when fully established, will be effective in ensuring that intended functions are maintained consistent with the current licensing basis for the period of extended operation.

The Buried and Underground Piping and Tanks Inspection Program is a new program to be implemented at Waterford 3. Buried piping inspection activities have begun at Waterford 3 in response to industry initiatives on ground water protection and buried piping integrity. Inspections performed to date have been initiated in accordance with NEI 09-14. A soil potential survey was completed to assess the effectiveness of the cathodic protection system. The survey concluded that Waterford-3's single, remote shallow anode bed was capable of providing adequate protection for the majority of plant piping, especially when other factors such as corrosivity of the soil and protection to pipe afforded by cement encasement is considered.

The following are inspections, corrective measures and assessments that were performed.

- Health reports for 2013 and 2014 indicate the NEI 09-14 activities are effectively managing the effects of aging through identification and resolution of conditions. Overall health was acceptable in fourth quarter 2014. Cathodic protection system availability was reduced due to failures of the power cable. A modification has been installed to correct the cause of the power cable failure and restore cathodic protection system availability. A modification was completed to move the highest radiological risk piping from below ground to above. The affected piping was the liquid radioactive effluent release line, which is not within the scope of license renewal.

- During an inspection performed in 2013, a crack in the concrete encasement around the condensate dump piping to the condensate storage tank was identified. The engineering inspection concluded that there was no evidence of leakage or corrosion from the pipe (no washout areas, erosion or rust in the vicinity of the crack). The crack was sealed prior to backfilling the excavation.

- During an inspection performed in 2014, steam generator feed pump turbine drain tank to condenser pipe wall thinning was found greater than site procedure allowables. No leakage was found. Evaluations determined that the risk to groundwater and to secondary chemistry if leakage should occur prior to the next refueling outage is low. Repair of the degraded piping and any additional required inspections was scheduled for the next refueling outage in accordance with the corrective action program.

Review of operating experience at Waterford 3 identified no aging mechanisms not already considered in Section XI.M41 of NUREG-1801 and LR-ISG-2011-03. Industry operating experience will be considered in the implementation of this program. Plant operating experience will be gained as the program is fully implemented and will be factored into the program via the confirmation and corrective action elements of the Waterford 3 10 CFR 50 Appendix B quality assurance program. Therefore, there is reasonable assurance that the Buried and Underground Piping and Tanks Inspection Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Buried and Underground Piping and Tanks Inspection Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.4 COATING INTEGRITY

Program Description

The Coating Integrity Program is a new program that will consist of periodic visual inspections of coatings applied to the internal surfaces of in-scope components in an environment of raw water, treated water, lubricating oil, or fuel oil where loss of coating or lining integrity could impact the component's and downstream component's current licensing basis intended function(s). For coated surfaces that do not meet the acceptance criteria, physical testing is performed where physically possible in conjunction with coating repair or replacement. The training and qualification of individuals involved in coating inspections of noncementitious coatings are conducted in accordance with ASTM standards endorsed in Regulatory Guide (RG) 1.54, including limitations, if any, identified in RG 1.54 on a particular standard. For cementitious coatings, training and qualifications are based on an appropriate combination of education and experience related to inspecting concrete surfaces.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Coating Integrity Program will be consistent with program elements described in LR-ISG-2013-01 for XI.M42, Internal Coatings/Linings for In-scope Piping, Piping Components, Heat Exchangers, and Tanks, with the following exception.

Exceptions to NUREG-1801

The Coating Integrity Program has the following exception.

Elements Affected	Exception
4. Detection of aging effects	NUREG-1801 recommends periodic inspections of internally coated piping. The WF3 program will provide a one-time inspection of the internal coating for the 11-foot diameter carbon steel circulating water piping.[1]

1. The carbon steel main circulating water pipe is in service during normal plant operation. Beginning at the discharge of the circulating water pumps, the 11-foot diameter pipe is internally coated with coal tar epoxy. The pipe connects with an 11-foot diameter uncoated concrete main circulating water pipe on the plant side of the levee. This pipe is in the scope of license renewal to provide a source of water to refill the wet cooling tower basin in the unlikely event that the basin is emptied by a tornado. A one-time inspection of the coated carbon steel pipe segment is adequate for the following reasons.
    - The probability of a tornado emptying the wet cooling tower is extremely low.

1. (continued)

    - In the event that any coating material became detached during normal operation, the circulating water flow would transport the coal tar epoxy to the condenser water box. Coating degradation sufficient to cause flow blockage during normal operation would be indicated in the control room as a change in the temperature across any affected water box and as a decrease in condenser vacuum.
    - The water boxes are routinely cleaned (approximately once per year) and any degraded coating transported to the water box would be observed during the cleaning operation.
    - A review of WF3 operating experience found no record of degraded circulating water pipe coating plugging condenser tubes.
    - During the tornado event, it is assumed that there is a loss of offsite power resulting in a loss of the main circulating water pumps. Therefore, any detached coal tar epoxy would settle to the bottom of the 11-foot concrete pipe because of the low flow in the pipe and the fact that the coal tar epoxy density is greater than raw water. The 16-inch uncoated water supply line to the wet cooling tower basin attaches to the 11-foot concrete pipe at a point 5.5 feet above the bottom. Thus, any detached coating material would not plug the 16-inch uncoated water supply line.
    - The one-time inspection will be performed within the 10 years prior to the period of extended operation and will include 50 percent of the total length of the pipe segment that is coated with coal tar epoxy as recommended in the NUREG-1801, XI.M42 aging management program described in LR-ISG-2013-01.
    - The acceptance criteria and corrective actions for this inspection will be consistent with the recommendations of NUREG-1801, XI.M42.

Enhancements

None

Operating Experience

The following discussion provides objective evidence that the Coating Integrity Program, when fully established, will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The Coating Integrity Program is a new program being implemented at Waterford 3. Since the program has not been implemented, there is no site-specific operating experience related to program findings. Industry operating experience will be considered in the implementation of this program. Plant operating experience will be gained as the program is executed and will be factored into the program via the confirmation and corrective action elements of the Waterford 3 10 CFR 50 Appendix B quality assurance program.

As discussed in element 10 to NUREG-1801, Section XI.M42, the inspection techniques and training of inspection personnel associated with this program will be consistent with industry practices that have been demonstrated effective at detecting loss of coating or lining integrity. Accordingly, there is reasonable assurance that this new aging management program will be effective through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Coating Integrity Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.5 COMPRESSED AIR MONITORING

Program Description

The Compressed Air Monitoring Program manages loss of material in compressed air systems by periodically monitoring the air for moisture and contaminants and by inspecting system internal surfaces. Air quality is maintained in accordance with limits based on consideration of manufacturer recommendations as well as guidelines in EPRI NP-7079, EPRI TR-108147, ASME OM-S/G-1998 (Part 17), and ANSI/ISA-S7.0.01-1996. Inspection frequencies and acceptance criteria are in accordance with SOER 88-01 and applicable industry standards. Documents such as EPRI NP-7079, ASME OM-S/G-1998 (Part 17), and ANSI/ISA-S7.0.01-1996 provide guidance on preventive measures, inspection of components, and testing and monitoring air quality. Periodic and opportunistic internal visual inspections of components (accumulators, flex hoses, tubing, etc.) are performed to monitor for signs of corrosion. Air quality parameters are trended to determine if alert levels or limits are being approached or exceeded.

NUREG-1801 Consistency

The Compressed Air Monitoring Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M24, Compressed Air Monitoring.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise Compressed Air Monitoring Program procedures to include the EDG starting air system.
2. Preventive Actions	Revise Compressed Air Monitoring Program procedures to apply consideration of the guidance of ASME OM-S/G-1998 (Part 17), EPRI NP-7079, and EPRI TR-108147 to the limits specified for the air system contaminants.

Element Affected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending	Revise Compressed Air Monitoring Program procedures to include periodic and opportunistic visual inspections of accessible internal surfaces of system components, including accumulators, flex hoses, and tubing. Specify inspections at frequencies recommended in ASME OM-S/G-1998 (Part 17).

Operating Experience

The following operating experience provides objective evidence that the Compressed Air Monitoring Program will be effective in ensuring that intended functions will be maintained consistent with the current licensing basis through the period of extended operation.

- In 2014, WF3 personnel reviewed site procedures for compliance with the most current instrument air quality guidance (ANSI/ISA-S7.0.01-1996) and for compliance with ISO-8573. The reviewers concluded that the site procedures incorporated the most current instrument air quality standards and that the procedures were consistent with the provisions of ISO-8573.

- In May 2013, an instrument air leak was identified on an instrument air supply line to a main feedwater regulating valve. The cause of the leak was determined to be either vibration or maintenance in the vicinity of the leak. The leak was corrected and the component restored to operable status.

As discussed in element 10 to NUREG-1801, Section XI.M24, this program considers the technical information and industry operating experience provided in NRC IN 81-38; IN 87-28; IN 87-28, Supplement 1; License Event Report 50-237/94-005-3; NRC GL 88-14; Institute of Nuclear Power Operations (INPO) SOER 88-01; EPRI NP-7079; and EPRI TR-108147.

Maintaining air quality in accordance with established industry standards provides reasonable assurance that the Compressed Air Monitoring Program will remain effective for managing loss of material of components. The application of this proven approach provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Compressed Air Monitoring Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.6 CONTAINMENT INSERVICE INSPECTION – IWE

Program Description

The Containment Inservice Inspection (CII) – IWE Program implements the requirements of 10 CFR 50.55a. The regulations in 10 CFR 50.55a impose the inservice inspection (ISI) requirements of the ASME Boiler and Pressure Vessel (B&PV) Code, Section XI, Subsection IWE, for steel containments (Class MC) and steel liners for concrete containments (Class CC). The WF3 containment is a low-leakage, free-standing steel containment vessel (SCV) consisting of a vertical upright cylinder with a hemispherical dome and an ellipsoidal bottom. The SCV's ellipsoidal bottom is encased in concrete and founded on the common concrete foundation with the shield building. The common concrete foundation with the shield building is classified as Class CC equivalent. The steel ellipsoidal bottom plate of the SCV was erected on top of the common concrete foundation slab with a concrete slab poured on top of the bottom plate. Since the Class CC equivalent concrete foundation slab and the bottom steel plate are inaccessible, they are exempted from examination in accordance with IWL-1220(b) and IWE-1220(b). There are no tendons associated with the WF3 SCV. The code of record for the examination of the WF3 Class MC and Class CC components is ASME Code Section XI, Subsections IWE and IWL, 2001 Edition with the 2003 Addenda, as mandated and modified by 10 CFR 50.55a.

The scope of the program includes the SCV and its integral attachments, containment equipment hatches, airlocks, moisture barriers, and pressure-retaining bolting. The program performs visual examinations (general visual, VT-1 and VT-3) to assess the general condition of the containment and to detect evidence of degradation that may affect structural integrity or leak tightness. The visual inspections monitor the condition of the SCV surface, including welds, base metal and integral attachments, personnel and equipment access hatches, and pressure-retaining bolting. The CII-IWE Program specifies acceptance criteria, corrective actions, and provisions for expansion of the inspection scope when identified degradation fails to meet the acceptance criteria.

The technical evaluation of NRC Information Notice (IN) 92-20 for applicability concluded that a valid Type B LLRT of the WF3 containment penetration bellows could be performed in accordance with the requirements of 10 CFR Part 50 Appendix J. Therefore, the IN 92-20 recommendation for augmented inspection of the bellows does not apply to the WF3 program.

The CII-IWE Program includes provisions to ensure that the selection of bolting material, installation torque or tension, and the use of lubricants and sealants are appropriate for the intended purpose. Implementing procedures use recommendations delineated in NUREG-1339 and industry recommendations delineated in Electric Power Research Institute (EPRI) NP-5769, NP-5067 and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque.

NUREG-1801 Consistency

The Containment Inservice Inspection – IWE Program, with enhancement, will be consistent with the program described in NUREG-1801, Section XI.S1, ASME Section XI, Subsection IWE.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Element Affected	Enhancement
2. Preventive Actions	Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting from Section 2 of Research Council on Structural Connections publication “Specification for Structural Joints Using ASTM A325 or A490 Bolts.”

Operating Experience

The following operating experience provides objective evidence that the CII-IWE Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- A general visual examination of the interior surface of the containment vessel was conducted during the 2003 refueling outage. The purpose of the general visual examination is to assess the general condition of the containment vessel and to detect evidence of degradation that may affect structural integrity or leak tightness. This examination is done in accordance with the CII-IWE Program, which conforms to the requirements of ASME Section XI, Subsection IWE.

  The general visual examination report documented whether the screening criteria were met or if a condition existed that failed to meet the screening criteria listed in the CII-IWE Program. Conditions were identified on the surface of the containment vessel during the general visual examination that failed to meet the screening criteria. However, the identified conditions do not jeopardize the structural integrity or leaktightness of the containment. The majority of the conditions noted were uncoated surfaces, blisters greater than size No. 6 as specified in ASTM D174, and excessive wear defined as wear which results in removal of the coating material to expose bare metal. Also, one gouge that was 0.078 inches deep and coated was identified. This gouge had also been identified in the fall refueling outage of 2000. There was no change in the gouge’s shape or size. The gouge depth is less than 10 percent of the bare metal thickness (2 inches) and within code allowable flaw size. Other areas of the containment vessel identified during the 2003 refueling outage with paint that was flaking, peeling, blistering, or exhibiting discoloration required a VT-3 examination. WF3 condition reports were issued to document the VT-3 examinations of areas with degraded coating. Details on the locations and conditions of the areas inspected were recorded in the VT-3 exam documentation.

- During a VT-3 inspection performed in 2008 of the containment inner moisture barrier (located between the containment vessel and the concrete floor on the ledge on elevation -4), six degraded locations were noted that required repair. Degradation was due to the effects of aging and to mechanical damage to the moisture barrier. None of the affected areas showed signs of wetting, and no corrosion of the containment vessel was noted. The damaged portions of the moisture barrier were removed and replaced with new sealant. A condition report was initiated to track and trend the findings of the examinations. All examination findings were satisfactory.

NRC IN 2010-12, "Containment Liner Corrosion," identifies the potential for corrosion in locations that are primarily unique to concrete containments with steel liner plates in direct contact with the concrete. As indicated in the information notice, containment liner corrosion is often the result of liner plates being in contact with objects and materials that are lodged between or embedded in the containment concrete. The WF3 containment vessel is a free-standing unit. The only portion in contact with concrete is the embedded bottom of the vessel.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the CII-IWE Program has been effective. The continued use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The CII-IWE Program provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.7 CONTAINMENT LEAK RATE

Program Description

The Containment Leak Rate Program consists of tests performed in accordance with the regulations and guidance provided in 10 CFR Part 50, Appendix J, “Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors,” Option B; RG 1.163, “Performance-Based Containment Leak-Testing Program”; NEI 94-01, “Industry Guideline for Implementing Performance-Based Options of 10 CFR Part 50, Appendix J”; and ANSI/ANS 56.8, “Containment System Leakage Testing Requirements.” The Containment Leak Rate Program provides for detection of pressure boundary degradation due to aging effects such as loss of leakage tightness, loss of material, cracking, loss of sealing, or loss of preload in various systems penetrating containment. The program also provides for detection of age-related degradation in material properties of gaskets, O-rings, and packing materials for the containment pressure boundary access points.

Three types of tests are performed under Option B. Type A tests are performed to determine the overall primary containment integrated leakage rate at the loss of coolant accident peak containment pressure. Performance of the integrated leakage rate test (ILRT) per 10 CFR Part 50, Appendix J, Option B demonstrates the leak-tightness and structural integrity of the containment. A general visual examination of the accessible interior and exterior areas of the steel containment vessel is performed prior to any ILRT during a period of reactor shutdown (refueling outages) and during two subsequent refueling outages before the next Type A test. The ILRT is performed at the frequency specified in 10 CFR Part 50, Appendix J, Option B. Type B and Type C containment LLRTs, as defined in 10 CFR Part 50, Appendix J, are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. LLRTs are performed at frequencies in accordance with the provisions of 10 CFR Part 50, Appendix J, Option B.

The parameters monitored are leakage rates of the steel containment vessel and associated welds, penetrations, fittings, and other access openings. The leakage rate acceptance criteria are established in accordance with 10 CFR Part 50, Appendix J, Option B.

The Containment Leak Rate Program provides measures to detect degradation prior to loss of intended function. The Containment Leak Rate Program detects degradation of the containment shell and components that may compromise the containment pressure boundary, including seals and gaskets. The use of pressure tests verifies the pressure-retaining integrity of the containment. The containment leakage rate tests demonstrate the leak-tightness of containment isolation barriers. While satisfactory performance of containment leakage rate tests demonstrates the leak-tightness and structural integrity of the containment, it does not by itself provide information that would indicate that aging degradation has initiated or that the capacity of the containment may have been reduced. This is achieved with implementation of a containment inservice inspection program as described in ASME Section XI, Subsection IWE.

The Containment Leak Rate Program documents and trends test results in accordance with the provisions of 10 CFR Part 50, Appendix J, Option B. The Containment Leak Rate Program demonstrates that the test results meet the acceptance criteria.

Evaluations are performed for test or inspection results that do not satisfy established criteria and a condition report (CR) is initiated to document the issue in accordance with plant administrative procedures.

The 10 CFR Part 50, Appendix B corrective action program ensures that conditions adverse to quality are promptly corrected. Corrective actions are performed in accordance with applicable procedures that meet the requirements of 10 CFR Part 50, Appendix J, Option B.

NUREG-1801 Consistency

The Containment Leak Rate Program is consistent with the program described in NUREG-1801, Section XI.S4, 10 CFR Part 50, Appendix J.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Containment Leak Rate Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- A containment building electrical penetration failed an as-left LLRT following cable replacement during an inspection performed in 2011. The actual leakage exceeded the operational limit. The total containment leakage remained less than the required Technical Specifications limits. Therefore, the as-left condition did not result in a loss of the containment function.

- In 2012, an LLRT was performed on the containment building airlock inner door seal. Measured leakage exceeded the administrative limit. The airlock was inspected, and the leak was identified as originating from the door seal due to potential wear associated with opening and closing of the door. The degraded seal was replaced and the subsequent test was satisfactory.

- While performing LLRT on a main steam line penetration in 2014, excessive leakage was found. Visible inspection identified potential leak sources at six locations around the perimeter of the primary guard pipe bellows. The leakage was attributed to degraded welds. A condition report was initiated and corrective actions were scheduled and completed in accordance with the work management process. As the total containment leakage was below the maximum allowable overall leakage rate, this condition did not represent a loss of containment intended function.

- In 2014, an inside containment check valve on a fire protection header failed its LLRT. A work order was initiated for repairs. Following completion of this repair, the component was retested and found satisfactory.
- While performing LLRT on a feedwater isolation valve in 2014, the air accumulator pressure drop test failed due a check valve not seating. The check valve was replaced, and the subsequent LLRT accumulator pressure drop test was successfully completed.

In 2014, the NRC issued Information Notice 2014-07, Degradation of Leak-Chase Channel Systems for Floor Welds of Metal Containment Shell and Concrete Containment Metallic Liner. This information notice concerned degradation of leak-chase channel systems of steel containment shells or steel liners of concrete containment structures. WF3 does not have channels installed to encompass the welds in the ellipsoidal bottom head of the steel containment vessel. There are no actions warranted at WF3 as a result of this information notice.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the Containment Leak Rate Program has been effective. The continued use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Containment Leak Rate Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.8 DIESEL FUEL MONITORING

Program Description

The Diesel Fuel Monitoring Program manages loss of material and reduction of heat transfer due to fouling in piping, tanks and other components in an environment of diesel fuel oil. This is performed by receipt inspection before allowing fuel oil to enter the storage tanks. Parameters monitored include water content, sediment, total particulate, and levels of microbiological activity. The program includes multi-level sampling of fuel oil storage tanks. Where multi-level sampling cannot be performed due to design, a representative sample is taken from the lowest part of the tank. When biological activity is identified, biocides are added.

The Diesel Fuel Monitoring Program inspects low flow areas where contaminants may collect such as in the bottom of tanks. The tanks are periodically sampled, drained, cleaned, and inspected for signs of moisture, contaminants and corrosion. Internal tank inspections will be performed at least once during the 10-year period prior to the period of extended operation and at least once every 10 years during the period of extended operation. Where degradation is observed, a wall thickness determination is made, and the extent of the condition is verified as a part of the corrective action program. Applicable industry standards and guidance documents are used to establish sampling frequency unless specified in Technical Specifications. The One-Time Inspection Program (Section B.1.28) includes inspections to verify that the Diesel Fuel Monitoring Program has been effective at managing the effects of aging.

NUREG-1801 Consistency

The Diesel Fuel Monitoring Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M30, Fuel Oil Chemistry.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise the Diesel Fuel Monitoring Program procedures to include the auxiliary diesel generator fuel oil tank and the emergency diesel generator (EDG) fuel oil feed tanks.

Element Affected	Enhancement
5. Monitoring and Trending	Revise Diesel Fuel Monitoring Program procedures to monitor and trend water content, sediment, particulates, and microbiological activity in the fuel oil tanks within the scope of the program at least quarterly.
4. Detection of Aging Effects	Revise Diesel Fuel Monitoring Program procedures to include periodic multi-level sampling of tanks within the scope of the program. Include provisions to obtain a representative sample from the lowest point in the tank if tank design does not allow for multi-level sampling.
4. Detection of Aging Effects	Revise Diesel Fuel Monitoring Program procedures to include periodic cleaning and internal visual inspection of tanks within the scope of the program. In the areas of any degradation identified during the internal inspection, a volumetric inspection shall be performed. In the event an internal inspection cannot be performed due to design limitations, a volumetric examination shall be performed. Perform cleaning and internal inspections at least once during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals.

<u>Operating Experience</u>

The following operating experience provides objective evidence that the Diesel Fuel Monitoring Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- During a March 2013 INPO assessment, an observer noted the WF3 diesel fuel was not being routinely monitored in accordance with industry guidance. Specifically, diesel fuel was not being monitored for biodiesel or lubricity. Site procedures were revised to include biodiesel and lubricity analysis on all diesel fuel oil receipts. The contract with the diesel fuel supplier was changed to require the supplier to perform biodiesel and lubricity analysis on diesel fuel oil shipments.

- In December 2013, an adverse trend for diesel fuel oil particulate level was identified during routine sampling. Although samples reviewed indicated an adverse trend, levels remained within specification limits. Further evaluation by an offsite laboratory determined that no adverse trend existed. Tank recirculation and filtration was deemed unnecessary.

- In September 2014, diesel fuel oil particulate level was noted as elevated relative to previous results. Levels remained within specification limits. No additional actions were deemed necessary.

The results of recent diesel fuel sampling and tank inspections indicate that the Diesel Fuel Monitoring Program has been effective. The continued application of proven sampling and inspection methods provides assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Diesel Fuel Monitoring Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.9 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC COMPONENTS

Program Description

The Environmental Qualification (EQ) of Electric Components Program manages the effects of thermal, radiation, and cyclic aging through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. The NRC has established nuclear station EQ requirements in 10 CFR Part 50, Appendix A, Criterion 4, and 10 CFR 50.49. 10 CFR 50.49 specifically requires that an EQ program be established to demonstrate that certain electrical components located in harsh plant environments (that is, those areas of the plant that could be subject to the harsh environmental effects of a loss of coolant accident [LOCA], high energy line breaks [HELBs] or high radiation) are qualified to perform their safety function in those harsh environments. 10 CFR 50.49 requires that the effects of significant aging mechanisms be addressed as part of environmental qualification.

As required by 10 CFR 50.49, EQ components are refurbished, replaced, or their qualification is extended prior to reaching the aging limits established in the evaluation. Re-analysis of an aging evaluation addresses attributes of analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions. Some aging evaluations for EQ components are time-limited aging analyses (TLAAs) for license renewal.

EQ Component Reanalysis Attributes

The reanalysis of an aging evaluation is performed to extend the qualification by reducing excess conservatism incorporated in the prior evaluation. Reanalysis of an aging evaluation to extend the qualification of a component is performed on a routine basis pursuant to 10 CFR 50.49(e) as part of an EQ program. While a component life limiting condition may be due to thermal, radiation, or cyclical aging, the vast majority of component aging limits are based on thermal conditions. Conservatism may exist in aging evaluation parameters, such as the assumed ambient temperature of the component, an unrealistically low activation energy, or in the application of a component (de-energized versus energized). The reanalysis of an aging evaluation is documented according to the station's quality assurance program requirements that require the verification of assumptions and conclusions. As already noted, important attributes of a reanalysis include analytical methods, data collection and reduction methods, underlying assumptions, acceptance criteria, and corrective actions (if acceptance criteria are not met). These attributes are discussed below.

Analytical Methods: The analytical models used in the reanalysis of an aging evaluation are the same as those applied during the prior evaluation. The Arrhenius methodology is an acceptable thermal model for performing a thermal aging evaluation. The analytical method used for a radiation aging evaluation is to demonstrate qualification for the total integrated dose (that is, normal radiation dose for the projected installed life plus accident radiation dose). For license renewal, one acceptable method of establishing the 60-year normal radiation dose is to multiply the 40-year normal radiation dose by 1.5 (that is, 60 years/40 years). The result is added to the accident radiation dose to obtain the total integrated dose for the component. For cyclical aging, a similar approach may be used. Other models may be justified on a case-by-case basis.

Data Collection and Reduction Methods: Reducing excess conservatism in the component service conditions (for example, temperature, radiation, cycles) used in the prior aging evaluation is the chief method used for a reanalysis. Temperature data used in an aging evaluation is to be conservative and based on plant design temperatures or on actual plant temperature data. When used, plant temperature data can be obtained in several ways. These include monitors used for Technical Specification compliance, other installed monitors, measurements made by plant operators during rounds, and temperature sensors on large motors (while the motor is not running). A representative number of temperature measurements are conservatively evaluated to establish the temperatures used in an aging evaluation. Plant temperature data may be used in an aging evaluation in different ways, such as (a) directly applying the plant temperature data in the evaluation, or (b) using the plant temperature data to demonstrate conservatism when using plant design temperatures for an evaluation. Any changes to material activation energy values as part of a reanalysis are to be justified on a plant-specific basis. Similar methods of reducing excess conservatism in the component service conditions used in prior aging evaluations can be used for radiation and cyclical aging.

Underlying Assumptions: EQ component aging evaluations contain sufficient conservatism to account for most environmental changes occurring due to plant modifications and events. When unexpected adverse conditions are identified during operational or maintenance activities that affect the normal operating environment of a qualified component, the affected EQ component is evaluated and appropriate corrective actions are taken that may include changes to the qualification bases and conclusions.

Acceptance Criteria and Corrective Actions: The reanalysis of an aging evaluation could extend the qualification of the component. If the qualification cannot be extended by reanalysis, the component is to be refurbished, replaced, or requalified prior to exceeding the period for which the qualification remains valid. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or requalify the component if the reanalysis is unsuccessful).

NUREG-1801 Consistency

The Environmental Qualification (EQ) of Electric Components Program is consistent with the program described in NUREG-1801, Section X.E1, Environmental Qualification (EQ) of Electric Components.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Environmental Qualification (EQ) of Electric Components Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The overall effectiveness of the Environmental Qualification (EQ) of Electric Components Program is demonstrated by the operating experience for systems, structures, and components in the program. In addition, the program has been subject to periodic internal and external assessments that have resulted in program improvements.

- A focused self-assessment was conducted in 2011 to evaluate the overall health of the EQ Program at Waterford 3 and to determine if the EQ Program is adequate to meet the requirements of 10 CFR 50.49. The assessment team recommended that Waterford 3 ensure additional personnel are qualified to maintain EQ files. Having additional personnel qualified would better ensure the success of the program when there is turnover of key personnel. The assessment finding was closed when a backup program owner was fully qualified.

  The assessment identified three changes to EQ-related preventive maintenance tasks that resulted in incorrect allowable replacement dates. The potential consequences were that a component could be installed in the plant for a period of time that is outside the limitations established for qualification. Because the affected components were replaced within the allowable window, the errors resulted in no impact on equipment qualification. The allowable replacement dates were corrected. Based on a review of other EQ preventive maintenance task changes, the assessment team concluded that the condition was an isolated case.

Condition report searches were performed using keywords *equipment qualification* and *EQ*. No additional aging management program issues were identified in this search.

The continued use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Environmental Qualification (EQ) of Electric Components Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.10 EXTERNAL SURFACES MONITORING

Program Description

The External Surfaces Monitoring Program manages aging effects of components fabricated from metallic, elastomeric, and polymeric materials through periodic visual inspection of external surfaces for evidence of loss of material, cracking, and change in material properties. When appropriate for the component and material, physical manipulation, such as pressing, flexing and bending, is used to augment visual inspections to confirm the absence of elastomer hardening and loss of strength. External Surfaces Monitoring Program is also credited for situations where the material and environment combinations are the same for the internal and external surfaces such that the external surfaces are representative of the internal surfaces.

Inspections are performed at least once every refueling cycle by personnel qualified through a plant-specific program. Deficiencies are documented and evaluated under the corrective action program. Surfaces that are not readily visible during plant operations and refueling outages are inspected when they are made accessible and at such intervals that would ensure the component's intended functions are maintained.

Periodic representative surface inspections of the in-scope mechanical indoor components under insulation (with process fluid temperature below the dew point) and outdoor components under insulation will be performed.

For polymeric materials, the visual inspection will include 100 percent of the accessible components. The sample size of flexible polymeric components that receive physical manipulation is at least 10 percent of the available surface area.

Acceptance criteria are defined to ensure that the need for corrective action is identified before a loss of intended function. For stainless steel, a clean shiny surface is expected. For flexible polymeric materials, a uniform surface texture (no cracks) and no change in material properties (e.g., hardness, flexibility, physical dimensions, color unchanged from when the material was new) are expected. For rigid polymeric materials, acceptable conditions are no surface changes affecting performance, such as erosion, cracking, crazing, checking, and chalking.

Inspection parameters for metallic components include the following.

- Corrosion (loss of material).
- Leakage from or onto external surfaces (loss of material).
- Worn, flaking, oxide coated surfaces (loss of material).
- Corrosion stains on thermal insulation (loss of material).
- Protective coating degradation (cracking, flaking, and blistering).
- Leakage for detection of cracks on the external surfaces of stainless steel components exposed to an air environment containing halides.

Inspection parameters for polymers include the following.

- Surface cracking, crazing, scuffing, and dimensional change (e.g., ballooning and necking).
- Discoloration.
- Exposure of internal reinforcement for reinforced elastomers.
- Hardening as evidenced by a loss of suppleness during manipulation where the component and material are appropriate for manipulation.
- Shrinkage, or loss of strength.

Thermal insulation is credited to reduce heat transfer from components in the safeguards pump rooms, shutdown cooling heat exchanger rooms and wing area to ensure that functions described in 10 CFR 54.4(a) are successfully accomplished. Insulation is installed in accordance with a plant-specific procedure that refers to a manufacturer specification. The manufacturer specification includes configuration features such as overlap and location of seams.

NUREG-1801 Consistency

The External Surfaces Monitoring Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M36, External Surfaces Monitoring of Mechanical Components, as modified by LR-ISG-2011-03, Changes to the Generic Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, “Buried and Underground Piping and Tanks,” and LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise External Surfaces Monitoring Program procedures to include instructions to perform a 100 percent visual inspection of accessible flexible polymeric component surfaces. The visual inspection should identify indicators of loss of material due to wear to include dimensional change, surface cracking, crazing, scuffing, and for flexible polymeric materials with internal reinforcement, the exposure of reinforcing fibers, mesh, or underlying metal. In addition, 10 percent of the available flexible polymeric surface area should receive physical manipulation to augment the visual inspection to confirm the absence of hardening and loss of strength (e.g., HVAC flexible connectors).
4. Detection of Aging Effects	Revise External Surfaces Monitoring Program procedures to conduct representative inspections during each 10-year period on insulated surfaces of each material type (e.g., steel, stainless steel, copper alloy, aluminum) in an air–outdoor or condensation environment.
4. Detection of Aging Effects	Revise External Surfaces Monitoring Program procedures as follows. 1) Remove insulation in order to perform a visual inspection of a representative sample of insulated indoor components surfaces in a condensation environment and outdoor component surfaces. The inspections shall include a minimum of 20 percent of the in-scope piping length for each material type (e.g., steel, stainless steel, copper alloy, aluminum), or for components with a configuration which does not conform to a 1-foot axial length determination (e.g., valve, accumulator), 20 percent of the surface area. Alternatively, insulation can be removed and a minimum of 25 inspections performed that can be a combination of 1-foot axial length sections and individual components for each material type.

Element Affected	Enhancement
4. Detection of Aging Effects (cont.)	2) Include inspection locations based on the likelihood of corrosion under insulation (i.e., components experiencing alternate wetting and drying in environments where trace contaminants could be present and for components that operate for long periods of time below the dew point). 3) Allow subsequent inspections to consist of an examination of the exterior surface of the insulation for indications of damage to the jacketing or protective outer layer of the insulation, if the following conditions are verified in the initial inspection: no loss of material due to general, pitting or crevice corrosion, beyond that which could have been present during initial construction, and no evidence of cracking. 4) Ensure that if the external visual inspections of the insulation reveal damage to the exterior surface of the insulation or there is evidence of water intrusion through the insulation (e.g., water seepage through insulation seams or joints), periodic inspections under the insulation will continue at such intervals that would ensure the component's intended function.
4. Detection of Aging Effects	Revise External Surfaces Monitoring Program procedures to provide guidance that removal of tightly adhering insulation that is impermeable to moisture is not required unless there is evidence of damage to the moisture barrier. However, the entire population of in-scope accessible piping component surfaces that have tightly adhering insulation will be visually inspected for damage to the moisture barrier with the same frequency as for other types of insulation inspections. These inspections will not be credited towards the inspection quantities for other types of insulation.

Element Affected	Enhancement
6. Acceptance Criteria	Revise External Surfaces Monitoring Program procedures to include the following acceptance criteria. • Stainless steel should have a clean shiny surface with no discoloration. • Other metals should not have any abnormal surface indications. • Flexible polymeric materials should have a uniform surface texture and color with no cracks and no unanticipated dimensional change, no abnormal surface with the material in an as new condition with respect to hardness, flexibility, physical dimensions, and color. • Rigid polymeric materials should have no erosion, cracking, checking, or chalking.

Operating Experience

The following operating experience provides objective evidence that the External Surfaces Monitoring Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In 2006, a self-assessment of the external corrosion program was performed. This assessment identified actions to make programmatic improvements and make adjustments to work management processes. Completed actions included developing a master list of external corrosion issues and contracting with an outside vendor to support revision of the external corrosion program. Corrective action plans for previous events were reviewed and found adequate.

- In October 2013, severe external corrosion was noted on a normally isolated nonsafety-related pipe during performance of painting activities. The pipe was evaluated and determined to remain functional. Action to replace the pipe section is scheduled in an approved work tracking process.

- In October 2014 and in February 2015, adverse trends in the number of instances of external corrosion potentially impacting safety-related equipment at Waterford 3 were identified. An action to develop a method of identifying and tracking corrosion-related work orders is complete. Several other actions are pending to address identification and resolution of external corrosion on plant equipment, including approval of site procedure for coating and corrosion program, completion of walkdowns to identify external corrosion in accordance with the new procedure guidelines, and determination of the current level of degradation for conditions involving safety-related components already entered in normal work processes.

As discussed in element 10 to NUREG-1801, Section XI.M36, this program considers the industry operating experience from many utilities since the mid-1990's in support of the maintenance rule (10 CFR 50.65).

Corrective action plans and site focus in this area will ensure that this program is effective in maintaining the material condition of plant systems. The continued application of proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The External Surfaces Monitoring Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.11 FATIGUE MONITORING

Program Description

The Fatigue Monitoring Program ensures that fatigue usage remains within allowable limits for components identified to have a fatigue TLAA by (a) tracking the number of critical thermal and pressure transients for selected components, (b) verifying that the severity of monitored transients is bounded by the design transient definitions for which they are classified, and (c) assessing the impact of the reactor coolant environment on a set of sample critical components including those from NUREG/CR-6260 and those components identified to be more limiting than the components specified in NUREG/CR-6260. Tracking the number of critical thermal and pressure transients for the selected components ensures a cumulative usage factor (CUF) for fatigue within allowable limits, including environmental effects where applicable. The program monitors the number of occurrences for the plant transients that cause significant fatigue usage. The program also provides for updates of fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached or in a case where a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components has been modified.

NUREG-1801 Consistency

The Fatigue Monitoring Program, with enhancements, will be consistent with the program described in NUREG-1801, Section X.M1, Fatigue Monitoring.

Exceptions to NUREG-1801

None

Enhancement

Enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise Fatigue Monitoring Program procedures to monitor and track additional critical thermal and pressure transients for components that have been identified to have a fatigue TLAA.

Element Affected	Enhancement
1. Scope of Program	Develop a set of fatigue usage calculations that consider the effects of the reactor water environment for a set of sample reactor coolant system components. This sample shall include the locations identified in NUREG/CR-6260 and additional plant-specific component locations in the reactor coolant pressure boundary if they are found to be more limiting than those considered in NUREG/CR-6260. F_{en} factors shall be determined using the formulae listed in LRA Section 4.3.3.
4. Detection of Aging Effects	Revise Fatigue Monitoring Program procedures to provide updates of the fatigue usage calculations on an as-needed basis if an allowable cycle limit is approached or in a case where a transient definition has been changed, unanticipated new thermal events are discovered, or the geometry of components has been modified.

Operating Experience

The following operating experience provides objective evidence that the Fatigue Monitoring Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In June 2004, a QA surveillance identified that the Fatigue Monitoring Program was not being adequately implemented. The site procedure was revised to identify design engineering as the department responsible for implementing the program.
- In August 2004, Waterford 3 personnel found that a pressurizer thermal transient analysis did not fully consider the impact of all transients; therefore, the predicted fatigue usage factor of the lower vessel region and existing flaw analyses may not be bounding. Calculations were revised to address applicable transients. The results of the new analysis were incorporated into design and licensing basis documents. The results were also incorporated into operating limits into site procedures.
- In January 2015, a Waterford 3 condition report documented that the provisions of the fatigue monitoring procedure were not being adequately implemented. The corrective action plan included the following.
  - Perform a review of fatigue analyses to identify which plant transients need to be tracked.

- Review past operating history to determine the number of these transient events the plant has experienced.

- Initiate additional actions, if required, to incorporate the results of these reviews in the Fatigue Monitoring Program.

Monitoring cycle counts and initiating corrective action maintain the validity of associated fatigue analyses. Completion of the identified corrective action plan discussed above will provide additional assurance that the Fatigue Monitoring Program will be effective in the future. The application of this proven monitoring approach provides assurance that the associated analyses will remain valid or that appropriate corrective actions will be taken such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Fatigue Monitoring Program provides reasonable assurance that the fatigue design basis will be maintained such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.12 FIRE PROTECTION

Program Description

The Fire Protection Program manages cracking, loss of material, delamination, separation, and change in material properties (e.g., shrinkage, loss of strength) through periodic visual inspection of components and structures with a fire barrier intended function (i.e., seals, fire barrier walls, ceilings, floors, and other fire resistant materials, such as flamastic, fire wrapping, spray-on fire proofing material, etc.). The program also performs periodic visual and functional testing of fire doors to ensure their operability.

The program includes visual inspections of not less than 10 percent of each type of penetration fire seal at least once per refueling cycle. These inspections examine any sign of degradation, such as cracking, seal separation from walls and components, separation of layers of material, rupture and puncture of seals that are directly caused by increased hardness, and shrinkage of seal material. If any signs of degradation are detected within the sample, the scope of the inspection is expanded to include additional seals.

Visual inspections of the fire barrier walls, ceilings and floors in structures within the scope of license renewal are performed at a frequency of at least once per refueling cycle. Inspections of fire barriers include inspections of coatings and wraps. Visual inspection of the fire barrier walls, ceilings, and floors and other fire barrier materials to detect any sign of degradation, such as cracking, spalling, and loss of material caused by chemical attack, and reaction with aggregates, are performed to ensure their intended fire protection functions are maintained.

Periodic visual and functional tests are used to manage the aging effects of fire doors. The frequency of visual inspections of the fire door surfaces and functional testing of fire doors closing mechanisms and latches is at least once per refueling cycle.

WF3 does not have a Halon or carbon dioxide fire suppression system.

NUREG-1801 Consistency

The Fire Protection Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M26, Fire Protection.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Fire Protection Program procedures to include an inspection at least once per refueling cycle of fire barrier walls, ceilings, and floors for any signs of degradation, such as spalling, loss of material caused by chemical attack, or reaction with aggregates.
4. Detection of Aging Effects	Revise Fire Protection Program procedures to inspect fire-rated doors for any degradation of door surfaces at least once per refueling cycle.
4. Detection of Aging Effects	Revise Fire Protection Program procedures to ensure fire barrier seals are inspected by personnel qualified in accordance with appropriate NFPA standards.
6. Acceptance Criteria	Revise Fire Protection Program procedures to provide acceptance criteria of no significant indications of concrete spalling, and loss of material of fire barrier walls, ceilings, and floors and in other fire barrier materials.
6. Acceptance Criteria	Revise Fire Protection Program procedures to provide acceptance criteria that specify no surface degradation of fire doors.

Operating Experience

The following operating experience provides objective evidence that the Fire Protection Program will be effective in ensuring that applicable component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In April 2004, during a visual inspection of fire rated floors, walls, and ceilings per site procedures, cracks were found in a pyrocrete fire barrier. The fire barrier was repaired.
- During the March 2009 fire protection self-assessment, assessors identified a condition regarding how the site maintains documentation of accessibility of fire seals (since inaccessible seals were not required to be inspected). Waterford 3 inspects all penetration seals and therefore documentation regarding fire seal accessibility is not necessary.
- In September 2013, a crack below the top hinge of a fire door was identified. The door remained capable of performing its fire barrier function.

- During the NRC Triennial fire protection inspection in January 2015, the fire door to the emergency feedwater pump room was found not self-latching. The door was repaired by lubricating the latch.

As discussed in element 10 to NUREG-1801, Section XI.M26, this program considers the technical information and industry operating experience provided in NRC IN 88-56, IN 94-28, IN 97-70, IN 91-47 and NRC GL 92-08.

The identification of degradation and initiation of corrective action prior to loss of intended function provide reasonable assurance that the Fire Protection Program will remain effective. The continued application of proven inspection methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Fire Protection Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.13 FIRE WATER SYSTEM

Program Description

The Fire Water System Program manages loss of material, flow blockage due to fouling, and loss of coating integrity for in-scope long-lived passive water-based fire suppression system components using periodic flow testing and visual inspections. When visual inspections are used to detect loss of material and fouling, the inspection technique is capable of detecting surface irregularities that could indicate wall loss due to corrosion, corrosion product deposition, and flow blockage due to fouling.

Testing or replacement of sprinkler heads that have been in service for 50 years is performed in accordance with the 2011 Edition of NFPA 25. Portions of the water-based fire water system that (a) are normally dry, but periodically subject to flow (e.g., dry-pipe or downstream of the deluge valve in a deluge system) and (b) cannot be drained or allow water to collect are subject to augmented examination beyond that specified in NFPA 25. The augmented examinations for the portions of normally dry piping that are periodically wetted or experiencing recurring internal corrosion include (a) periodic full flow tests at the design pressure and flow rate, or internal inspections, and (b) volumetric wall thickness evaluations.

Water system pressure is continuously monitored such that loss of pressure is detected and corrective action initiated.

The training and qualification of individuals involved in fire water storage tank coating inspections is conducted in accordance with ASTM International standards endorsed in RG 1.54, including limitations, if any, identified in RG 1.54 on a particular standard.

Program acceptance criteria include (a) the water-based fire protection system can maintain required pressure, (b) no unacceptable signs of degradation or fouling are observed during non-intrusive or visual inspections, and (c) in the event surface irregularities are identified, testing is performed to ensure minimum design pipe wall thickness is maintained. In the event the fire water tank fails to meet the acceptance criteria for coating or the tank (e.g., peeling, delamination, blistering, flaking, cracking, or rust), the program requires an evaluation to ensure the tank can perform its intended function until the next inspection and that downstream flow blockage is not a concern.

NUREG-1801 Consistency

The Fire Water System Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M27, Fire Water System, as modified by LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation, with the following exceptions.

Exceptions to NUREG-1801

The Fire Water System Program has the following exceptions.

Element Affected	Exception
4. Detection of Aging Effects	NFPA 25, Section 5.2.1 specifies annual sprinkler inspections. WF3 performs the sprinkler inspections every refueling cycle.[1]
4. Detection of Aging Effects	NFPA 25, Section 6.3.1 specifies flow testing every 5 years at the hydraulically most remote hose connections of each zone of an automatic standpipe system to verify the water supply still provides the design pressure at the required flow. WF3 performs main header flow testing in the main headers that supply the standpipe system to verify the water supply provides the design pressure and required flow.[2]
4. Detection of Aging Effect	NFPA 25, Section 13.2.5 specifies annual main drain tests at each water based system riser to determine if there is a change in the condition of the water piping and control valves. WF3 performs the main drain tests every refueling cycle.[3]
4. Detection of Aging Effect	NFPA 25, Section 14.2 specifies performing at least every 5 years an internal inspection of the wet and dry fire water piping. WF3 performs full flow testing of the piping downstream of the deluge valves for transformers, but does not perform an internal inspection on the dry piping downstream of the deluge valves for the transformers.[4]
4. Detection of Aging Effect	NFPA 25 Section 9.2.7.1 specifies an evaluation of interior tank coatings in accordance with the adhesion test of ASTM D 3359, Standard Test Methods for Measuring Adhesion by Tape Test, generally referred to as the “cross-hatch test.” WF3 inspects the tank interior coating for damage, chips, blisters, peeling, pinholes, rust or any local or general failure of the coating every 5 years. In addition, WF3 performs ultrasonic thickness checks or mechanical measurements of any identified corroded areas. WF3 does not apply the cross-hatch test.[5]

Element Affected	Exception
4. Detection of Aging Effect	NFPA 25 Section 13.4.3.2.3 requires preaction valves to be trip tested every 3 years with the control valve fully open. WF3 trip tests the preaction valves with the control valves cracked open. [6]

1. As indicated by the note in Table 4a of LR-ISG-2012-02, access for some inspections is feasible only during refueling outages, which are scheduled every 18 months. Inspections performed at least once every refueling cycle interval have been effective at maintaining component intended function.
2. To flow test the hydraulically most remote hose connection of the automatic standpipe system in a manner that would provide sufficient information to verify design pressure and flow would generate a large quantity of liquid that is potentially radwaste and could create a risk of wetting components critical to normal and shut down operations. By not performing additional flow testing, the potential for creating radwaste and increasing operational risk is reduced.

   WF3 tests the fire hoses listed in the Technical Requirements Manual (TRM) every 3 years, performs main drain tests every 18 months, and verifies the fire water system valve line-up monthly per the TRM. Acceptance criteria consist of verifying valve operability and flow through valve and connection with no indication of obstruction or undue restriction of water flow.

   In addition, Section 6.3.1 has been revised in the 2014 Edition of NFPA-25 to indicate this testing provision is only applicable to Class 1 and Class 3 standpipe systems. The automatic standpipe system at WF3 is a Class 2 system.
3. As indicated by the note in Appendix D, Table 4a of LR-ISG-2012-02, access for some inspections is feasible only during refueling outages, which are scheduled every 18 months. Main drain tests performed at least once every refueling cycle interval have been effective at maintaining component intended function.
4. Performing full flow testing downstream of the deluge valves associated with the transformers at least once per refueling outage satisfactorily indicates whether excessive organic or inorganic material exists within the system.

5. Cross hatch testing is a destructive test. WF3 performs a visual inspection of the fire water tank interior coating every 5 years. RG 1.54 describes the use of ASTM test standard D4541-09, "Pull-Off Strength of Coatings Using Portable Adhesion Testers," as an acceptable alternative method for performing adhesion testing of coatings on metal substrates using a fixed-alignment adhesion tester. In addition, lightly tapping, scraping or cleaning the degraded area per Society of Protective Coatings (SSPC) SSPC-SP2, Hand Tool Cleaning; SSPC-SP3, Power Tool Cleaning; SSPC-SP11, Cleaning of Bare Metal; and SSPC-SP WJ-1, 2, 3 and 4, Water Jet Cleaning, allow a qualified inspector and design engineering the ability to determine the extent of peeling, delamination and blistering to ensure that downstream flow blockage and tank integrity are not an issue. Ultrasonic thickness measurement where there is evidence of pitting or corrosion ensures the tank thickness is sufficient to perform its pressure boundary function. WF3 will perform spot wet sponge tests and dry film testing to identify coating adhesion deficiencies. When indications are identified in the fire water tank coating, WF3 performs an evaluation to ensure the tank can perform its function until the next inspection. In addition, WF3 performs ultrasonic thickness checks or mechanical measurements of any identified corroded areas.
6. Trip testing the preaction valves with the control valve fully open would allow fire water to enter the portion of the system that is designed to be dry. In addition there is a potential for wetting down equipment critical to normal and shut down operations. Because the preaction system has closed sprinkler heads and supervisory air it is unlikely that operations would not be aware of a leaking closed sprinkler head.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Fire Water System Program Procedures to inspect for loss of fluid in the glass bulb heat responsive elements.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform an inspection of wet fire water system piping condition every 5 years by opening a flushing connection at the end of one main and by removing a sprinkler toward the end of one branch line for the purpose of inspecting the interior for evidence of loss of material and the presence of foreign organic or inorganic material that could result in flow obstructions or blockage of a sprinkler head. The inspection method used shall be capable of detecting surface irregularities that could indicate wall loss below nominal pipe wall thickness due to corrosion, corrosion product deposition, and flow blockage due to fouling. Ensure procedures require a follow-up volumetric wall thickness evaluation where irregularities are detected.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform an internal inspection for evidence of loss of material and the presence of foreign organic or inorganic material that could result in flow obstructions or blockage of a sprinkler head of the dry piping downstream of preaction systems. The inspection method used shall be capable of detecting surface irregularities that could indicate wall loss below nominal pipe wall thickness due to corrosion, corrosion product deposition, and flow blockage due to fouling.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform an internal inspection for evidence of loss of material and the presence of foreign organic or inorganic material that could result in flow obstructions or blockage of a sprinkler head of the dry piping downstream of the automatic deluge systems. The inspection method used shall be capable of detecting surface irregularities that could indicate wall loss below nominal pipe wall thickness due to corrosion, corrosion product deposition, and flow blockage due to fouling.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform an inspection of the nozzles associated with the charcoal filters for loss of material and foreign or organic material when the charcoal is replaced.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Fire Water System Program procedures to inspect the interior of the fire water tanks in accordance with NFPA 25 (2011 Edition), Sections 9.2.6 and 9.2.7, including sub-steps.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to remove strainers every 5 years to clean and inspect for damage and corroded parts.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to specify that sprinkler heads are tested or replaced in accordance with NFPA-25 (2011 Edition), Section 5.3.1.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to conduct a flow test or flush sufficient to detect potential flow blockage, or conduct a visual inspection of 100 percent of the internal surface of piping segments that cannot be drained or piping segments that allow water to collect in each 5-year interval, beginning 5 years prior to the period of extended operation.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform volumetric wall thickness inspections of 20 percent of the length of piping segments that cannot be drained or piping segments that allow water to collect each 5-year interval of the period of extended operation. Measurement points shall be obtained to the extent that each potential degraded condition can be identified (e.g., general corrosion, MIC). The 20 percent of piping that is inspected in each 5-year interval is in different locations than previously inspected piping.
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to perform a blockage evaluation if the flowing pressure decreases by more than 10 percent from the original main drain test or previous main drain tests.
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to flow test the charcoal filter unit's manual deluge valve systems with air on an annual basis to ensure there are no obstructions. If obstructions are found, the system shall be cleaned and retested.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to trip test with flow at least once every 18 months the deluge valve systems for the main turbine lube oil tank and main feedwater pumps. If obstructions are found, the system shall be cleaned and retested.
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to open and close hydrant valves slowly while performing flow tests to prevent surges in the system. The program shall also require full opening of the hydrant valve.
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to verify the hydrants drain within 60 minutes after flushing or flow testing.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform vacuum box testing on the bottom of the tank to identify leaks. In the event the bottom of the fire water tank is uneven, the station will perform a suitable NDE technique rather than vacuum box testing to identify leaks.
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to ensure the training and qualification of the individual performing the evaluation of fire water storage tank coating degradation is in accordance with ASTM International standards endorsed in RG 1.54, including limitations, if any, identified in RG 1.54 on a particular standard.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to perform wet sponge and dry film testing on the coating applied to the interior of the fire water tanks.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Fire Water System Program procedures to conduct augmented flow tests or flushing and wall thickness measurements for fire water piping experiencing recurring internal corrosion prior to the period of extended operation and at least once every 5 years during the period of extended operation. Procedures shall be revised to require wall thickness measurements at selected locations that provide a representative sample of the type of piping and environment where the recurring corrosion is occurring. The procedure should allow for selected grid locations to change based on the relevance and usefulness of the wall thickness measurements.
4. Detection of Aging Effects	Revise the Fire Water System Program procedures to ensure a fire water tank is not returned to service after identifying interior coating blistering, delamination or peeling unless there are only a few small intact blisters surrounded by coating bonded to the substrate as determined by a qualified coating inspector, or the following actions are performed: • Any blistering in excess of a few small intact blisters or blistering not completely surrounded by coating bonded to the substrate is removed. • Any delaminated or peeled coating is removed. • The exposed underlying coating is verified to be securely bonded to the substrate as determined by an adhesion test endorsed by RG 1.54 at a minimum of three locations. • The outermost coating is feathered and the remaining outermost coating is determined to be securely bonded to the coating below via an adhesion test endorsed by RG 1.54 at a minimum of three locations adjacent to the defective area. • Ultrasonic testing is performed where there is evidence of pitting or corrosion to ensure the tank meets minimum wall thickness requirements. • An evaluation is performed to ensure downstream flow blockage is not a concern. • A follow-up inspection is scheduled to be performed within two years and every two years after that until the coating is repaired, replaced, or removed.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Fire Water System Program procedures to determine the extent of coating defects on the interior of the fire water tanks by using one or more of the following methods when conditions such as cracking, peeling, blistering, delamination, rust, or flaking are identified during visual examination. • Lightly tapping and scraping the coating to determine the coating integrity. • Dry film thickness measurements at random locations to determine overall thickness of the coating. • Wet-sponge testing or dry film testing to identify holidays in the coating. • Adhesion testing in accordance with ASTM D3359, ASTM D4541, or equivalent testing endorsed by RG 1.54 at a minimum of three locations. • Ultrasonic testing where there is evidence of pitting or corrosion to determine if the tank thickness meets the minimum thickness criteria.

Element Affected	Enhancement
6. Acceptance Criteria	Revise Fire Water System Program procedures to include acceptance criteria for the fire water tanks' interior coating that include: • Indications of peeling and delamination are not acceptable. • Blisters are evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including limitations, if any, identified in RG 1.54 on a particular standard. Blisters should be limited to a few intact small blisters that are completely surrounded by sound coating/lining bonded to the substrate. Blister size and frequency should not be increasing between inspections (e.g., reference ASTM D714-02, "Standard Test Method for Evaluating Degree of Blistering of Paints"). • Indications such as cracking, flaking, and rusting are to be evaluated by a coatings specialist qualified in accordance with an ASTM International standard endorsed in RG 1.54 including limitations, if any, identified in RG 1.54 on a particular standard. • As applicable, wall thickness measurements, projected to the next inspection, meet design minimum wall requirements. • Quantify the ability of the coating adhesion to meet the plant-specific design requirements specific to the coating/lining substrate for the fire water tanks based on visual inspections, wet sponge testing, or dry film testing.
6. Acceptance Criteria	Revise Fire Water System Program procedures to include acceptance criteria of no abnormal debris (i.e., no corrosion products that could impede flow or cause downstream components to become clogged). Any signs of abnormal corrosion or blockage will be removed, its source and extent of condition determined and corrected, and entered into the corrective action program.

Element Affected	Enhancement
7. Corrective Action	Revise Fire Water System Program procedures to specify replacement of any sprinkler heads that show signs of leakage, excessive loading, corrosion, or loss of fluid in the glass bulb heat responsive element.
7. Corrective Action	Revise Fire Water System Program procedures to perform an obstruction evaluation if any of the following conditions exist: • There is an excessive discharge of material during routine flow tests. • An inspector's test valve is clogged during routine testing. • Foreign materials are identified during internal inspections. • Sprinkler heads are found clogged during removal or testing. • Pin hole leaks are identified in fire water piping. • After an extended fire water system shutdown (greater than one year). • There is a 50% increase in time it takes for water to flow out the inspector test valve after the associated dry valve is tripped when compared to the original acceptance criteria or last test.
7. Corrective Action	Revise Fire Water System Program procedures to evaluate for MIC if tubercules or slime are identified during any internal inspections of fire water piping.

Operating Experience

The following operating experience provides objective evidence that the Fire Water Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In January 2011, a fire protection valve was found to have a small leak (wet rust stain on the floor, drip on cap). This condition was entered into the work control system for correction.
- In January 2012, a fitting on a sprinkler head riser for the cable vault suppression system was found to have a minor leak. The condition was evaluated and determined to not impact the ability of the system to perform its design function. This condition was entered into the work control system for correction.

- In 2013, while performing fire water flow test for a start-up transformer, one spray nozzle was found clogged. This condition was entered into the work control system for correction.
- In 2014, a fire protection audit was performed. The purpose of the audit was to evaluate the effectiveness of program implementation and to evaluate the adequacy of the Fire Protection Program in meeting the requirements of the Entergy Quality Assurance Program Manual and applicable governing procedures. No issues related to the effects of aging on the fire water system were documented.

The identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the Fire Water System Program will remain effective. The continued application of proven inspection and testing methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Fire Water System Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.14 FLOW-ACCELERATED CORROSION

Program Description

The Flow-Accelerated Corrosion (FAC) Program manages loss of material due to wall thinning caused by FAC for carbon steel piping and components through (a) performing an analysis to determine systems susceptible to FAC, (b) conducting appropriate analysis to predict wall thinning, (c) performing wall thickness measurements based on wall thinning predictions and operating experience, and (d) evaluating measurement results to determine the remaining service life and the need for replacement or repair of components.

The program also manages wall thinning due to various erosion mechanisms in treated water and steam systems for all materials that may be identified through industry or plant-specific operating experience.

Based on the most susceptible locations, a representative sample of components is selected for wall thickness measurements at a frequency in accordance with NSAC 202L, Rev. 3, guidelines to ensure that FAC degradation is identified and mitigated before component integrity is challenged. Measurement results are used to confirm predictions and to plan long-term corrective action. In the event of excessive wall thinning, the extent of the wall thinning is determined as a part of the corrective action program. The FAC Program relies on implementation of guidelines published by EPRI in NSAC-202L and on internal and external operating experience. The program uses a predictive code for portions of susceptible systems with design and operating conditions that are amenable to computer modeling. Inspections are performed using ultrasonic or other approved testing techniques capable of detecting wall thickness. Field measurements are used to corroborate the results of the predictive code and to recalibrate the model as appropriate. The model is also adjusted as a result of any power uprates. The time remaining before the component reaches the minimum allowable wall thickness is predicted using inspection results (i.e., measured data) and other methods to estimate the wear rate. Components are suitable for continued service if the predicted wall thickness at the next scheduled inspection is greater than or equal to the minimum allowable wall thickness.

NUREG-1801 Consistency

The FAC Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M17, Flow-Accelerated Corrosion, as modified by LR-ISG-2012-01, Wall Thinning Due to Erosion Mechanisms.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program 4. Detection of Aging Effects 5. Monitoring and Trending	Revise Flow-Accelerated Corrosion Program procedures to (1) manage wall thinning due to erosion mechanisms from cavitation, flashing, liquid droplet impingement, and solid particle impingement; (2) include susceptible locations based on the extent-of-condition reviews in response to plant-specific or industry operating experience, and EPRI TR-1011231, *Recommendations for Controlling Cavitation, Flashing, Liquid Droplet Impingement, and Solid Particle Erosion in Nuclear Power Plant Piping*, and NUREG/CR-6031, *Cavitation Guide for Control Valves*; (3) ensure piping and components replaced with FAC-resistant material and subject to erosive conditions are not excluded from inspections; and (4) include the need for continued wall thickness measurements of replaced piping until the effectiveness of the corrective action is assured.
7. Corrective Action	Revise Flow-Accelerated Corrosion Program procedures to evaluate wall thinning due to erosion from cavitation, flashing, liquid droplet impingement, and solid particle impingement when determining a replacement type of material.

Operating Experience

The following operating experience provides objective evidence that the FAC Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation. The program will be enhanced to address wall thinning due to erosion.

- In April 2004, a Flow Accelerated Corrosion Program self-assessment was performed. The most significant finding was a lack of sufficient resources (staffing) to effectively implement the program inspections. Action to address this finding included utilizing fleet shared resources to supplement plant staff.

- In response to an INPO letter in 2009, an internal assessment of the FAC program was completed. No AFIs or performance deficiencies were identified. Actions to address program weaknesses included updating FAC wear evaluations associated with power uprate, reviewing past FAC outage reports and updating program documentation, and incorporating input from engineering and operations regarding abnormal configurations.

- In December 2012, a FAC inspection identified a feedwater and heater drain pipe with wall thickness that projected to be less than the critical wall thickness prior to the next refueling outage. The critical wall thickness was a conservative value, and the component wear was not found to be significant. Engineering determined a new critical wall thickness, and the FAC Program owner updated the program software. The inspected component was found acceptable

- In 2013, a self-assessment of the FAC program was performed. The assessment documented several strengths including strong program ownership, consistency with applicable industry guidance (EPRI), adequate inspections, and proactive replacement of degrading piping. The main weakness was associated with a lack of program documentation, including a lack of documentation for review of some program elements. The main identified weakness was corrected under the corrective action program.

- In 2014, a FAC inspection identified wall thickness less than critical wall thickness for an extraction steam pipe. The condition was temporarily corrected with a weld overlay to allow operation until the next opportunity for replacement. The inspection scope was expanded to include similar components in similar configurations. Additional inspections were scheduled for the next refueling outage.

As discussed in element 10 to NUREG-1801, Section XI.M17, this program considers the technical information and industry operating experience provided in NRC Bulletin 87-01, NRC IN 92-35, IN 95-11, IN 2006-08, IN 97-84, IN 89-53, IN 91-18, IN 93-21, and Licensee Event Report 50-237/2007-003-00.

The identification of degradation and initiation of corrective action prior to loss of intended function and the identification of program deficiencies and subsequent corrective actions provide reasonable assurance that the Flow-Accelerated Corrosion Program will remain effective. The enhancement to include wall thinning due to erosion and continued application of proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Flow-Accelerated Corrosion Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.15 INSERVICE INSPECTION

Program Description

The Inservice Inspection (ISI) Program manages cracking, loss of material, and reduction in fracture toughness for ASME Class 1, 2, and 3 pressure-retaining components including welds, pump casings, valve bodies, integral attachments, and pressure-retaining bolting using periodic volumetric, surface, and visual examination and leakage testing of ASME Class 1, 2 and 3 components as specified in ASME Section XI code, 2001 Edition, 2003 addendum. Additional limitations, modifications and augmentations described in 10 CFR 50.55a are included as a part of this program. Every 10 years this program is updated to the latest ASME Section XI code edition and addendum approved by the NRC in 10 CFR 50.55a. Repair and replacement activities for these components are covered in Subsection IWA of the ASME code edition of record.

NUREG-1801 Consistency

The Inservice Inspection Program is consistent with the program described in NUREG-1801, Section XI.M1, ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the ISI Program will continue to be effective in assuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- Recent ISI program health reports (2012–2014) indicate overall program health is acceptable and stable with no significant improvements needed.
- The 2008 ISI outage report provided an abstract of repair and replacement activities necessary for continued service. There were no items with flaws or relevant conditions that required evaluation for continued service. The low number of cases shown in this report demonstrates the effectiveness of the ISI Program.
- The 2010 ISI outage report provided an abstract of repair and replacement activities necessary for continued service and an abstract of flaws or relevant conditions that

required evaluation for continued service. The low number of cases shown in this report demonstrates the effectiveness of the ISI program.

- In January 2010, surface examination for the nozzle-to-top head dome weld was not completed in the second ISI Program Interval as required by ASME Section XI. Actions to engineering were completed to support operability of the steam generator. The evaluation concluded that this was an isolated occurrence.

As discussed in element 10 to NUREG-1801, Section XI.M1, this program considers the technical information and industry operating experience provided in NRC IN 97-19, IN 84-18, IN 80-38, IN 94-63, IN 91-05, NRC Inspection Report 50-255/99012, IN 98-11, IN 97-46, NRC Bulletin 88-08, IN 2001-05, IN 2003-11 and its Supplement 1, IN 2004-11, IN 2006-27, IN 2005-02, IN 97-88, IN 82-37, IN 85-65, and IN 90-04.

The identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the Inservice Inspection Program will remain effective. The continued application of these proven inspection methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Inservice Inspection Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.16 INSERVICE INSPECTION – IWF

Program Description

The Inservice Inspection – IWF (ISI-IWF) Program performs periodic visual examinations of ASME Class 1, 2, and 3 piping and component supports to determine general mechanical and structural condition or degradation of component supports. The examinations include verification of clearances, settings and physical displacements and identification of loose or missing parts, debris, corrosion, wear, erosion, or the loss of integrity at welded or bolted connections. WF3 utilizes a free-standing steel containment vessel and does not have MC piping and component supports; therefore, they are not addressed under the WF3 program. The ISI-IWF Program is implemented through plant procedures which provide administrative controls, including corrective actions, for the conduct of activities that are necessary to fulfill the requirements of ASME Section XI, as mandated by 10 CFR 50.55a. The monitoring methods are effective in detecting the applicable aging effects, and the frequency of monitoring provides reasonable assurance that significant degradation can be identified prior to a loss of intended function.

The ISI-IWF Program is in its third 10-year ISI inspection interval. The ISI-IWF Program was developed in accordance with ASME Section XI, 2001 Edition through the 2003 Addenda as approved by 10 CFR 50.55a. In accordance with 10 CFR 50.55a(g)(4)(ii), the WF3 ISI-IWF Program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified twelve months before the start of the inspection interval.

The selection of component supports subject to examination is based upon Table IWF-2500-1, Examination Category F-A. The number of piping supports selected for inspection is based on consideration of ASME classification. The largest sample size is specified for ASME Class 1 piping supports (25 percent) and decreases for less critical supports (15 percent for ASME Class 2, and 10 percent for ASME Class 3). For component supports other than Class 1, 2, and 3 piping supports, a sampling process is not used; rather 100 percent of these supports is examined each ISI inspection interval. For multiple components other than piping, within a system of similar design, function, and service, the supports of only one of the multiple components must be examined.

Discovery of support deficiencies during regularly scheduled inspections is entered in the corrective action program. If the deficiencies fail to meet acceptance standards of IWF-3400, the scope of inspection is expanded to include additional supports in order to ensure the full extent of the deficiencies is identified. The method of inspection is by visual examination in accordance with IWF-2500 requirements.

Visual examinations are conducted to determine the general mechanical and structural condition of component supports. The VT-3 examination can also be used to detect loss of material and cracking of elastomeric vibration isolation elements or the loss of integrity at welded or bolted connections.

The ISI-IWF Program includes provisions to ensure that the selection of bolting material, installation torque or tension, and the use of lubricants and sealants are appropriate for the intended purpose. Implementing procedures use recommendations delineated in NUREG-1339 and industry recommendations delineated in the Electric Power Research Institute (EPRI) NP-5769, NP-5067, and TR-104213 to ensure proper specification of bolting material, lubricant, and installation torque. Plant procedures prohibit the use of lubricants containing molybdenum disulfide. Since the use of this type of lubricant is prohibited in plant procedures and plant procedures provide the technical guidance for installation requirements (lubricants or compounds used in threaded joints shall be suitable for the service conditions and shall not react unfavorably with the joint materials), stress corrosion cracking for high-strength structural bolting material, i.e., ASTM A325 and A490, is not plausible. Therefore, volumetric examinations are not included in the program.

Identified degradation that could compromise the component support intended function is entered into the corrective action program for evaluation and correction, if necessary, to ensure the intended function is maintained.

The ISI-IWF Program implementing procedures specify acceptance criteria and corrective actions. Supports that require corrective actions are re-examined during the next inspection period consistent with IWF-2420.

NUREG-1801 Consistency

The ISI-IWF Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.S3, ASME Section XI, Subsection IWF.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
2. Preventive Action	Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting from Section 2 of Research Council on Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

Element Affected	Enhancement
4. Detection of Aging Effects	Revise plant procedures to specify that detection of aging effects will include monitoring anchor bolts for loss of material, loose or missing nuts and bolts, and cracking of concrete around the anchor bolts.
6. Acceptance Criteria	Revise plant procedures to specify the following conditions as unacceptable: • Loss of material due to corrosion or wear, which reduces the load bearing capacity of the component support. • Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support. • Cracked or sheared bolts, including high strength bolts, and anchors.

Operating Experience

The following operating experience provides objective evidence that the ISI-IWF Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- During the October 2009 refueling outage, visual inspections identified no piping supports or component supports with relevant conditions that needed evaluation, repair, or replacement activities for continued service.
- During the March 2011 refueling outage, visual inspections identified no piping supports or component supports with relevant conditions that needed evaluation, repair, or replacement activities for continued service.
- During the October 2012 refueling outage, visual inspections identified the following supports or components with relevant conditions that required evaluation for continued service.
    - A rigid restraint for the safety injection system was evaluated for a degraded condition. It was determined that the structural integrity of the support was not compromised by the as-found condition. Maintenance personnel returned the inspected components to the design settings.
    - A spring hanger for the safety injection system was evaluated for being outside the acceptable range. It was determined that the as-found condition of the spring hanger would have no adverse effects on the structural integrity of the safety injection piping and its pipe supports.

- A rigid restraint for the main steam system was evaluated for a degraded condition. It was determined that the structural integrity of the pipe support was not adversely impacted by the as-found condition. The component was determined acceptable.

- During the April 2014 refueling outage, visual inspections identified some items with flaws or relevant conditions that required evaluation for continued service. The following conditions required replacement activities.

  - A feedwater rigid restraint and feedwater hydraulic snubber required replacement.

  - A component cooling water rigid restraint was found to have a corroded base plate support, which was replaced.

- An EFW piping support inspected in 2007 showed signs of rust. The corrosion was identified as superficial corrosion that does not affect the structural integrity of the support. A work order was initiated to clean and paint as necessary.

- A condition report written in 2007 identified pipe supports on main feedwater and main steam lines on the reactor auxiliary building roof and sundeck squeaked continuously. This section of main steam and main feedwater piping is not safety-related, is not the subject of any Technical Specifications or the Technical Requirements Manual, and is not required to support the function of any safety-related structures, systems or components. Engineering has inspected these supports. The evaluation concluded that this is not unusual for these supports as they are all metal and small vibrations (normal) will produce squeaks and rattles in the hardware.

- In 2008 the pipe supports for a main steam header were found with signs of surface corrosion at the base and near the main steam pipe. All the components were visually inspected. The corrosion is superficial surface corrosion that does not affect the integrity or operation of the components.

- During direct VT-3 inspection of feedwater system supports on the steam generators in 2012, four U-bolt whip restraints had loose nuts and excessive freedom of movement. An engineering review concluded that all four U-bolts were acceptable as is, since cold gaps were maintained as required and the bolts were able to perform their function.

- A condition report initiated in 2014 addressed multiple degraded supports on containment feedwater lines identified during the 2014 refueling outage. This was a rollup report of all of the condition reports that reported the following degraded supports on the containment feedwater lines.

  <u>Steam Generator 1 Feedwater Line</u>

  - Jam nut was loose and hanger rod lacked full engagement.
  - One load pin was missing from a hanger and another load pin was dislodged.

- A crack approximately 3–4 inches in length was discovered in the base plate weld of trunion.

Steam Generator 2 Feedwater Line

- One of the rods that attaches to pipe clamp was completely severed at the clamp.
- The snubber was bound in the clevis. Once the snubber was freed with mechanical assistance, the feedwater line shifted its position downward approximately six inches.

An engineering evaluation analyzed the effect of the damaged supports on the containment feedwater lines to the steam generators and the resulting stresses of the piping and the steam generator nozzles. This evaluation determined that allowable stresses were not violated and the lines maintained the capability to fulfill their feedwater and emergency feedwater design functions. Therefore, the intended function of the system was not challenged.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the ISI-IWF Program has been effective. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The ISI-IWF Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.17 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

Program Description

Cranes and hoists in the scope of license renewal are monitored in accordance with the existing Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. Related activities consist of periodic inspections and preventive maintenance that are relied upon to manage loss of material due to corrosion, loose bolting or rivets, and rail wear of cranes and hoists within the scope of license renewal and subject to aging management review. The activities entail visual examinations and functional testing to ensure that cranes and hoists are capable of sustaining their rated loads. The functional test examinations are performed on active components of the crane to ensure proper functionality and are not credited for managing the effects of aging of passive components of cranes and hoists.

The scope of the program includes structural components, including structural bolting, that make up the bridge, the trolley, and crane rails and includes cranes and hoists that meet the provisions of 10 CFR 54.4(a)(1) and (a)(2) and of NUREG-0612, *Control of Heavy Loads at Nuclear Power Plants*.

The aging management activities specified in this program will utilize the guidance provided in ASME Safety Standard B30.2, "Overhead and Gantry Cranes (Top Running Bridge, Single or Multiple Girder, Top Running Trolley Hoist)."

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M23, Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
3. Parameters Monitored or Inspected	Revise plant procedures to specify monitoring of crane rails for loss of material due to wear; monitoring structural components of the bridge, trolley and hoists for deformation, cracking, and loss of material due to corrosion; and monitoring structural connections for loose or missing bolts, nuts, pins or rivets and any other conditions indicative of loss of bolting integrity.
4. Detection of Aging Effects	Revise plant procedures to specify inspection frequency in accordance with ASME B30.2 or other appropriate standard in the ASME B30 series. Infrequently used cranes and hoists will be inspected prior to use. Bolted connections will be visually inspected for loose or missing bolts, nuts, pins or rivets at the same frequency as crane rails and structural components.
6. Acceptance Criteria	Revise plant procedures to require that significant loss of material due to wear of crane rails and any sign of loss of bolting integrity will be evaluated in accordance with ASME B30.2 or other appropriate standard in the ASME B30 series.
7. Corrective Action	Revise plant procedures to specify that maintenance and repair activities will utilize the guidance provided in ASME B30.2 or other appropriate standard in the ASME B30 series.

Operating Experience

The following operating experience provides objective evidence that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will be effective in managing the effects of aging such that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- A 2007 visual inspection of the intake structure crane found that 10 out of approximately 100 rail clips on the trolley were broken or missing. A work request was generated to repair or replace the clips.

- Visual inspections in 2009 identified rust, dirt and other foreign material on runways of trolley and bridge on fuel handling building crane. A corrective action was issued to clean the bridge and trolley runways on the fuel handling building crane and also wipe down the fuel handling building crane. This condition was corrected.

- In 2011, rust was identified on trolley rail supports for the turbine building gantry crane. This condition was corrected.
- In 2011 black flakes, which appeared to be oxidized iron, were observed along the length of the trolley tracks on the spent fuel handling machine. This foreign material appeared to be caused by the trolley rolling over the track, causing the flakes to spall off the iron rail. This minimal loss of material due to wear does not threaten ongoing functionality of the spent fuel handling machine.
- Visual inspections performed in 2014 during inspection of the polar crane identified a broken rail clamp hold down bolt. The adjacent bolts were tight. The crane remains capable of performing its function, and the condition was entered into the site work tracking system for correction.
- During a visual inspection of the intake structure crane in 2014, eight trolley rail clips were found missing due to corroded bolting. The missing clips were randomly distributed and had a minimum of two intact clips in between them. Therefore, the crane remained capable of performing its function.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program has been effective. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.18 INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

Program Description

The Internal Surfaces in Miscellaneous Piping and Ducting Components is a new program that will manage loss of material and reduction of heat transfer using representative sampling and opportunistic visual inspections of the internal surfaces of metallic and elastomeric components in environments of air–indoor (uncontrolled), air–outdoor, condensation, diesel exhaust, raw water, or waste water. Internal inspections will be performed during periodic system and component surveillances or during the performance of maintenance activities when the surfaces are accessible for visual inspection.

Where practical, the inspections will focus on the components most susceptible to aging because of time in service and severity of operating conditions. At a minimum, in each 10-year period during the period of extended operation, a representative sample of 20 percent of the population (defined as components having the same combination of material, environment, and aging effect) up to a maximum of 25 components per population will be inspected. Opportunistic inspections will continue in each period even if the minimum sample size has been inspected.

For metallic components, visual inspection will be used to detect evidence of loss of material and reduction of heat transfer due to fouling. For non-metallic components, visual inspections and physical manipulation or pressurization will be used to detect surface irregularities. Visual examinations of elastomeric components will be accompanied by physical manipulation such that changes in material properties are readily observable. The sample size for physical manipulation will be at least 10 percent of accessible surface area.

Specific acceptance criteria will be as follows:

- Stainless steel: clean surfaces, shiny, no abnormal surface condition.
- Metals: no abnormal surface condition.
- Elastomers: a uniform surface texture and color with no cracks, no unanticipated dimensional change, and no abnormal surface conditions.

Conditions that do not meet the acceptance criteria will be entered into the corrective action program for evaluation. Any indications of relevant degradation will be evaluated using design standards, procedural requirements, current licensing basis, and industry codes or standards.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be consistent with the program described in NUREG-1801, Section XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, as modified by LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program. Industry operating experience will be considered in the implementation of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the Waterford 3 10 CFR 50 Appendix B quality assurance program.

The Waterford 3 program is based on the program description in NUREG-1801 Section XI.M38, Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components, which in turn is based on industry operating experience that demonstrates that the activities applied in this program are effective for managing the relevant aging effects.

As discussed in element 10 to NUREG-1801, Section XI.M38, inspections of internal surfaces during the performance of periodic surveillance and maintenance activities have been in effect at many utilities in support of plant component reliability programs. These activities have proven effective in maintaining the material condition of plant systems, structures, and components. The elements that comprise these inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice.

As such, operating experience provides reasonable assurance that implementation of the Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.19 MASONRY WALL

Program Description

The Masonry Wall Program is based on guidance provided in Information Notice (IN) 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11." The program manages aging effects so that the evaluation basis established for each masonry wall within the scope of license renewal remains valid through the period of extended operation. WF3 performed a review of IE Bulletin 80-11, "Masonry Wall Design," and responded to the NRC that WF3 did not have any seismic Category I masonry (concrete block) walls.

The program includes visual inspection of masonry walls that perform intended functions as defined in accordance with 10 CFR 54.4. Included are masonry walls required by 10 CFR 50.48, radiation shielding masonry walls, and masonry walls with the potential to affect safety-related components. The periodic visual inspection of masonry walls within the scope of license renewal will detect aging effects of loss of material and cracking of masonry units and mortar. The Structures Monitoring Program (Section B.1.38) manages the effects of aging on structural steel components, steel edge supports and steel bracing of masonry walls. The aging effects identified that could impact a masonry wall's intended function or potentially invalidate its evaluation basis are entered into the corrective action program to determine the necessary corrective actions, which could include further analysis, repair, or replacement.

Masonry walls are inspected at least once every 5 years to ensure there is no loss of intended function.

NUREG-1801 Consistency

The Masonry Wall Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.S5, Masonry Wall Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise plant procedures to ensure masonry walls located within in-scope structures are included in the scope of the Masonry Wall Program.

Element Affected	Enhancement
3. Parameters Monitored or Inspected	Revise plant procedures to include monitoring gaps between the structural steel supports and masonry walls that could potentially affect wall qualification.
4. Detection of Aging Effects	Revise plant procedures to specify that masonry walls will be inspected at least once every 5 years with provisions for more frequent inspections in areas where significant aging effects (missing blocks, cracking, etc.) are observed to ensure there is no loss of intended function.
6. Acceptance Criteria	Revise plant procedures to include acceptance criteria for masonry wall inspections that ensure observed aging effects (cracking, loss of material, or gaps between the structural steel supports and masonry walls) do not invalidate the wall's evaluation basis or impact its intended function.

Operating Experience

The following operating experience provides objective evidence that the Masonry Wall Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- A 2004 condition report identified a masonry block wall surrounding a damper to be degraded. The degradation consisted of cracks approximately 1/32 inches wide. The condition was corrected by sealing the cracks.
- In 2004, personnel discovered multiple hairline cracks in concrete block walls in fire zone RAB-7. The fire protection engineer inspected the cracks and determined that they did not affect the capability of the walls to perform their fire barrier function. Engineering personnel inspected and evaluated the documented condition and concluded that the cracks do not compromise the structural integrity of the reactor auxiliary building and are acceptable as is.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the Masonry Wall Program has been effective. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Masonry Wall Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.20 METAL ENCLOSED BUS INSPECTION

Program Description

The Metal Enclosed Bus Inspection Program is a new program that will provide for the inspection of the internal and external portions of metal-enclosed bus (MEB) to identify age-related degradation of the bus and bus connections, the bus enclosure assemblies, and the bus insulation and insulators. The program will inspect the safety-related 4.16kV MEBs (non-segregated) between switchgear 3A3-S and 3AB3-S and 3B3-S and the safety-related 480V MEBs (non-segregated) between 3A31-S and 3AB31-S and 3B31-S.

Inspections of the MEB will include the bus and bus connections, the bus enclosure assemblies (internal and external), and the bus insulation and insulators. A sample of the accessible bus bolted connections will be inspected for increased connection resistance. These inspections will include visual inspections, as well as quantitative measurements, such as thermography or connection resistance measurements, as required. Thermography will be performed on bus connections with the MEB covers in place, only if the bus enclosure is equipped with an infrared window to facilitate the inspection.

MEB enclosure assembly external surfaces will be visually inspected for evidence of loss of material due to general, pitting, and crevice corrosion. Accessible elastomers (e.g., gaskets, boots, and sealants) will be inspected for change in material properties (elastomer degradation) including surface cracking, crazing, scuffing, dimensional change (e.g., ballooning and necking), shrinkage, discoloration, hardening, and loss of strength at least once every 10 years. This inspection will be performed by this program instead of the Structures Monitoring Program.

MEB enclosure assembly internal surfaces will be visually inspected for evidence of loss of material. Internal portions of the MEB enclosure assemblies will also be inspected for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion.

Bus insulation or insulators will be visually inspected for signs of reduced insulation resistance (IR) due to thermal/thermoxidative degradation of organics/thermoplastics, radiation-induced oxidation, moisture/debris intrusion, or ohmic heating, as indicated by embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination, which may indicate overheating or aging degradation. Internal bus supports or insulators will be visually inspected for structural integrity and signs of cracks.

A sample of accessible bolted connections will be inspected for increased connection resistance at least once every 10 years using quantitative measurements such as thermography or connection resistance (micro-ohm) measurements. Twenty percent of the population with a maximum sample of 25 constitutes a representative sample size for accessible bolted connections. Otherwise, a technical justification of the methodology and sample size used for selecting components should be included as part of the site documentation. If an unacceptable condition or situation is identified in the selected sample, a determination is made as to whether the same condition or situation is applicable to other connections not tested. The first inspection using thermography or measuring connection resistance will be completed prior to the period of extended operation with subsequent inspections every 10 years thereafter provided visual inspection is not used to inspect bolted connections. Since experience has shown that MEB bolted connection aging degradation is a slow process, this time span is an adequate period to preclude failures of the MEB bolted connections.

An alternative to quantitative measurements could be used for accessible MEB bolted connections covered with heat shrink tape, sleeving, insulating boots, etc. A sample of accessible bolted connections covered with heat shrink tape or insulating boots per manufacturer's recommendations can be inspected using the alternate qualitative methods. If the alternate inspection method using visual is the only method performed, the visual inspection must be performed prior to the period of extended operation and at least once every 5 years for insulation material surface anomalies such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination. If inspections include quantitative measurements, then the inspections must be performed at least once every 10 years.

The inspections will be completed before the period of extended operation, and at least once every 10 years thereafter provided visual inspection is not used as the only method to inspect a sample of accessible MEB bolted connections. If the inspection of a sample of accessible bolted connections uses visual methods only, this inspection will be completed prior to the period of extended operation, and at least once every 5 years thereafter.

NUREG-1801 Consistency

The Metal Enclosed Bus Inspection Program will be consistent with the program described in NUREG-1801, Section XI.E4, Metal Enclosed Bus Program.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Metal Enclosed Bus Inspection Program is a new program. Industry and plant-specific operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the WF3 10 CFR 50 Appendix B quality assurance program.

A search of site-specific operating experience did not reveal any issues with components associated with non-segregated bus that perform a license renewal intended function.

The WF3 program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. The elements of the program inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and have been used effectively at WF3 in other programs.

As discussed in element 10 to NUREG-1801, Section XI.E4, this program considers the technical information and industry operating experience provided in SAND 96-0344, IEEE Std. 1205-2000, NRC IN 89-64, NRC IN 98-36, NRC IN 2000-14, and NRC IN 2007-01.

The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Metal Enclosed Bus Inspection Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.21 NEUTRON-ABSORBING MATERIAL MONITORING

Program Description

The Neutron-Absorbing Material Monitoring Program provides reasonable assurance that degradation of the neutron-absorbing material (Boral) used in spent fuel pools that could compromise the criticality analysis will be detected. The program relies on periodic inspection and testing to assure that the effects of aging do not cause degradation that impacts the required 5 percent sub-criticality margin through the period of extended operation. The program is established to monitor loss of material, reduction in neutron-absorbing capacity, and changes in dimension such as blisters, pits and bulges that could result in a loss of neutron absorbing capability. The parameters monitored include physical measurements and geometric changes in test coupons. The approach to relating measurement results from coupons to the condition of material in the spent fuel racks considers the exposure the coupons have received versus the exposure the spent fuel racks have received. In the event that there is a loss of neutron-absorbing capacity based on coupon testing, additional testing will be performed to ensure the sub-criticality requirements are met.

NUREG-1801 Consistency

The Neutron-Absorbing Material Monitoring Program, with enhancement, will be consistent with the program described in NUREG-1801, Section XI.M40, Monitoring of Neutron-Absorbing Materials Other than Boraflex.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented and the inspection will be performed prior to the period of extended operation.

Element Affected	Enhancement
5. Monitoring and Trending	Revise Neutron-Absorbing Material Monitoring Program procedures to compare measurements from periodic inspections to prior measurements, and relate coupon measurement results to the performance of the spent fuel neutron-absorber materials considering differences in exposure conditions, vented/non-vented test samples, spent fuel racks, etc. Ensure the predicted boron-10 areal density will be sufficient to maintain the subcritical conditions required by technical specifications until the next coupon test.

Operating Experience

The following operating experience provides objective evidence that the Neutron Absorbing Material Monitoring Program will continue to be effective in assuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In 2001, testing of Boral surveillance coupons was performed. Visual inspection of the coupon found front and back surfaces were covered with uniform oxide film. There were no local corrosion pits. Both sides of the coupon had scratch marks from what appeared to have been a wire brush. The oxide film had formed over the scratch marks as well. A couple of black deposits were noted on each side of the coupon which appeared to be pieces of boron carbide which had broken through the aluminum skin of Boral. This likely occurred when Boral is hot rolled to its final plate configuration. No blisters were noted and no blisters developed during elevated temperature drying.

  The inspection report concluded these coupons were in good condition and areal density of Boron-10 was in excess of design values.

- In 2010, testing of Boral surveillance coupons was performed. Both coupons tested were fully intact with no apparent areas of missing Boral. Visual inspection found that both sides of the coupon were covered by a uniform oxide film. It appears as if some of the oxide was rubbed off during decontamination at Waterford. There are some 20 tear-shaped discolored areas on the front side. Inside each of these areas is a small corrosion pit.

  Two large corrosion pits were observed on the back side. A small blister was noted near the right edge of the back side. During drying at 300°F a second blister developed on the back side of this coupon.

  The inspection report concluded that the test results, including measurement of dimensions, dry weight, and boron-10 areal density, were indicative of satisfactory material performance (acceptable coupon performance and no loss of boron carbide).

- In October 2014, a condition documenting a discrepancy was identified between the frequency of Boral coupon testing specified in the site procedure and that specified in the preventative maintenance task coordinating the test. The procedure was revised to correct the condition (corrected both the preventative maintenance frequency and procedure).

The identification of degradation prior to loss of intended function provides reasonable assurance that the Neutron-Absorbing Material Monitoring Program will remain effective. The continued application of these proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Neutron-Absorbing Material Monitoring program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.22 NICKEL ALLOY INSPECTION

Program Description

The Nickel Alloy Inspection Program manages cracking due to primary water stress corrosion cracking (PWSCC) for nickel-alloy (Alloy 600/82/182) components and loss of material due to boric acid-induced corrosion in susceptible safety-related components in the vicinity of nickel-alloy reactor coolant pressure boundary components as required by 10 CFR 50.55a. It provides (a) inspection requirements for the reactor coolant pressure boundary components that contain PWSCC-susceptible dissimilar metals (Alloys 600/82/182) and (b) inspection requirements for reactor coolant pressure boundary components in the vicinity of PWSCC-susceptible dissimilar metals (Alloy 600/82/182).

The program monitors for reactor coolant pressure boundary cracking and leakage using various methods, including non-destructive examination techniques, radiation monitoring, and visual inspections for boric acid deposits or the presence of moisture to identify cracking in the reactor coolant pressure boundary or loss of material. Inspection methods, schedules and frequencies for susceptible components are implemented in accordance with 10 CFR 50.55a. Reactor coolant leakage is calculated and trended on a routine basis in accordance with technical specifications. The acceptance criteria for identified flaws and the methodology for evaluating the flaws are prescribed in 10 CFR 50.55a. Unacceptable indications of flaws are corrected through implementation of appropriate repair or replacement as dictated in 10 CFR 50.55a.

NUREG-1801 Consistency

The Nickel Alloy Inspection Program is consistent with the program described in NUREG-1801, Section XI.M11B, Cracking of Nickel-Alloy Components and Loss of Material due to Boric Acid-Induced Corrosion in Reactor Coolant Pressure Boundary Components.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Nickel Alloy Inspection Program will continue to be effective in assuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In October 2000, a small amount of boric acid was discovered in the area around an Inconel Alloy 600 pressurizer heater sleeve during a bare metal inspection. Corrective actions were completed to plug the heater sleeve, inspect all other pressurizer heater sleeves, and update the Nickel Alloy Inspection Program plan to address repair and replacement of heater sleeves.

- In April 2005, a small amount of boric acid was discovered in the annulus around two pressurizer heater sleeves during the bare metal inspection. The boric acid is evidence of primary water stress corrosion cracking (PWSCC) of the Alloy 600 heater sleeve. These nozzles and all the remaining pressurizer heater nozzles needing repair were repaired.

As discussed in element 10 to NUREG-1801, Section XI.M11B, this program considers the technical information and industry operating experience provided in NRC IN 90-10, IN 96-11, NRC GL 97-01, and NRC Bulletins 2001-01, 2002-01 and 2002-02.

The identification of degradation and initiation of corrective action prior to loss of intended function provide reasonable assurance that the Nickel Alloy Inspection Program will remain effective. The application of these proven methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Nickel Alloy Inspection Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.23 NON-EQ ELECTRICAL CABLE CONNECTIONS

Program Description

The Non-EQ Electrical Cable Connections Program is a new one-time inspection program that provides reasonable assurance that the intended functions of the metallic parts of electrical cable connections are maintained consistent with the current licensing basis through the period of extended operation. Cable connections included are those connections in the scope of license renewal susceptible to age-related degradation resulting in increased resistance of connection due to thermal cycling, ohmic heating, electrical transients, vibration, chemical contamination, corrosion, or oxidation that are not subject to the environmental qualification requirements of 10 CFR 50.49.

Inspection methods may include thermography, contact resistance testing, or other appropriate testing methods without removing the connection insulation, such as heat shrink tape, sleeving, or insulating boots. The one-time inspection provides additional confirmation to support industry operating experience that shows that electrical connections have not experienced a high degree of failures and that existing installation and maintenance practices are effective.

This program provides for one-time inspections that will be completed prior to the period of extended operation on a sample of connections. The factors considered for sample selection will be application (medium and low voltage, defined as < 35 kV), circuit loading (high loading), connection type, and location (high temperature, high humidity, vibration, etc.). The representative sample size will be 20 percent of the connection population with a maximum sample of 25.

The inspections will be performed prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Cable Connections Program will be consistent with the program described in NUREG-1801, Section XI.E6, Electrical Cable Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Electrical Cable Connection Program is a new program. Industry and plant-specific operating experience will be considered when implementing this program.

A search of site-specific operating experience did not reveal any issues with cable connections that perform a license renewal intended function.

Industry operating experience has shown that increased connection resistance due to loosening of connections and corrosion of connections could be a problem without proper installation and maintenance activities. Industry and WF3 operating experience supports performing this one-time inspection program in lieu of a periodic testing program. This one-time inspection program will verify that the installation and maintenance activities are effective.

As discussed in element 10 to NUREG-1801, Section XI.E6, this program considers the technical information and industry operating experience provided in NUREG/CR-5643, SAND96-0344, IEEE Std. 1205-2000, EPRI 109619, EPRI 104213, NEI White Paper on AMP XI.E6, Final License Renewal Interim Staff Guidance LR-ISG-2007-02, Staff Response to the NEI White Paper on AMP XI.E6, Licensee Event Report (LER) 3612007005, LER 3612007006 and LER 3612008006.

The WF3 program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. The elements of the program inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and have been used effectively at WF3 in other programs. The use of proven program activities provides reasonable assurance that the effects of aging are being managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Non-EQ Electrical Cable Connections Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.24 NON-EQ INACCESSIBLE POWER CABLES (≥ 400 V)

Program Description

The Non-EQ Inaccessible Power Cables (≥ 400 V) Program is a new condition monitoring program that will manage the aging effect of reduced insulation resistance on inaccessible or underground (e.g., in conduit, duct bank, or direct buried) power (≥ 400 V) cables that have a license renewal intended function.

The cables included in this program are routed underground and are connected to the 480 V electric motor-driven fire pump and the 480 V electric motor-driven jockey fire pump.

The Non-EQ Inaccessible Power Cables (≥ 400 V) Program will include periodic actions to prevent inaccessible cables from being exposed to significant moisture. Significant moisture is defined as periodic exposures to moisture that last more than a few days (e.g., cable wetting or submergence in water). Test frequencies are adjusted based on test results and operating experience. In this program, inaccessible power (≥ 400 V) cables exposed to significant moisture will be tested at least once every six years to provide an indication of the condition of the cable insulation properties, with the first test occurring before the period of extended operation. Test frequencies are adjusted based on test results and operating experience. The specific type of test performed is a proven test for detecting deterioration of the cable insulation.

The program will include periodic inspections of manholes at least once every year (annually) to assess that cables and cable support structures are intact, but the inspection frequency will not be increased if water is found in the manholes during the inspections. In addition to the periodic manhole inspections, manhole inspections for water after event-driven occurrences, such as flooding, will be performed.

A proven, commercially available test will be used for detecting deterioration of the insulation system due to wetting or submergence for inaccessible power cables (≥ 400 V) included in this program, such as dielectric loss (dissipation factor/power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state-of-the-art at the time the tests are performed. One or more tests are used to determine the condition of the cables.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Inaccessible Power Cables (≥ 400 V) Program will be consistent with the program described in NUREG-1801, Section XI.E3, Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements, with the following exception.

Exceptions to NUREG-1801

The Non-EQ Inaccessible Power Cables (≥ 400 V) Program has the following exception.

Elements Affected	Exception
2. Preventive Actions	NUREG-1801 recommends periodic actions are taken to prevent inaccessible cables from being exposed to significant moisture, such as identifying and inspecting in-scope accessible cable conduit ends and cable manholes for water collection, and draining the water, as needed. In addition, the inspection frequency for water collection is established based on plant-specific operating experience with cable wetting or submergence in manholes (i.e., the inspection is performed periodically based on water accumulation over time and event driven occurrences, such as heavy rain or flooding). At Waterford 3, periodic manhole inspections will be performed to assess that cables and cable support structures are intact, but the inspection frequency will not be increased if water is found in the manholes during the inspections.[1]

1. The 480V electric motor-driven fire pump and electric motor-driven jockey fire pump cables are non-1E, nonsafety-related cables. These cables are routed in raceways with manholes and handholes that are not safety-related. The provisions of 10 CFR 50, Appendix A (GDC-4) do not apply to the 480V electric-driven fire pump and electric-driven jockey fire pump cables because they are not safety-related. Because of the elevation of the plant site and the manholes, water cannot be prevented from entering the manholes. There are no splices in these underground cables, and there is no history of water treeing in cables that operate at less than 2 kV. Manhole inspections will assess cable and cable support damage, if any, due to exposure to significant moisture, and periodic cable testing will provide reasonable assurance that each cable will continue to perform its intended function through the period of extended operation.

Enhancements

None

Operating Experience

The Non-EQ Inaccessible Power Cable (≥ 400 V) Program is a new program. Industry and plant-specific operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented by other plants prior to entering the period of extended operation and that operating experience will be factored into the implementation of this program via the confirmation and corrective action elements of the WF3 10 CFR 50 Appendix B quality assurance program.

The WF3 response to GL 2007-01 identified one inservice cable failure. The apparent cause of the inservice cable failure was listed as moisture absorption. The cable was listed as a 5 kV Okonite or Anaconda cable with EPR insulation from 4.16 kV switchgear 3A2 to 3A4, and the inservice failure occurred after approximately 10–12 years of service. The failed cable does not have a license renewal intended function. A search of WF3 operating experience since the GL 2007-01 response did not identify any other cable failures.

A search of site-specific operating experience found no cables with license renewal intended function with age-related failures, nor were any aging mechanisms not considered in NUREG-1801 identified. There are no known failures of medium- or low-voltage cables directly attributed to submergence at WF3.

As discussed in element 10 of NUREG-1801, Section XI.E3, this program considers the technical information and industry operating experience provided in NUREG/CR-5643; IEEE Std. 1205-2000; SAND96-0344; EPRI 109619; EPRI 103834-P1-2; NRC IN 2002-12; NRC GL 2007-01; NRC GL 2007-01 Summary Report; NRC Inspection Procedure, Attachment 71111.06, Flood Protection Measures; NRC Inspection Procedure, Attachment 71111.01, Adverse Weather Protection; RG 1.211, Rev. 0; and NUREG/CR-7000.

The WF3 program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Non-EQ Inaccessible Power Cables (≥ 400 V) Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.25 NON-EQ SENSITIVE INSTRUMENTATION CIRCUITS TEST REVIEW

Program Description

The Non-EQ Sensitive Instrumentation Circuits Test Review Program is a new performance monitoring program that will manage the aging effects of the applicable cables in the following systems or sub-systems.

- Excore neutron flux monitoring system
- Radiation monitoring
  - Process monitoring system – component cooling water monitors
  - Area radiation monitoring system – channels 24-31
  - Area radiation monitoring system – high range containment area monitors
  - Area radiation system –fuel handling building
  - Airborne monitoring system – main control room monitors

The Non-EQ Sensitive Instrumentation Circuits Test Review Program provides reasonable assurance that the intended functions of sensitive, high-voltage, low-signal cables exposed to adverse localized equipment environments caused by heat, radiation and moisture (i.e., neutron flux monitoring instrumentation and process radiation monitoring) can be maintained consistent with the current licensing basis through the period of extended operation. Most sensitive instrumentation circuit cables and connections are included in the instrumentation loop calibration at the normal calibration frequency, which provides sufficient indication of the need for corrective actions based on acceptance criteria related to instrumentation loop performance. The review of calibration results or findings of surveillance testing programs will be performed once every 10 years, with the first review occurring before the period of extended operation.

For sensitive instrumentation circuit cables that are disconnected during instrument calibrations, testing using a proven method for detecting deterioration for the insulation system (such as insulation resistance tests or time domain reflectometry) will occur at least once every 10 years, with the first test occurring before the period of extended operation. Applicable industry standards and guidance documents are used to delineate the program.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Sensitive Instrumentation Circuits Test Review Program will be consistent with the program described in NUREG-1801, Section XI.E2, Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements Used in Instrumentation Circuits.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Sensitive Instrumentation Circuits Test Review Program is a new program. Industry operating experience will be considered in the implementation of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the WF3 10 CFR 50 Appendix B quality assurance program.

A search of site-specific operating experience did not reveal any failures with instrumentation cables and connections that perform a license renewal intended function.

As stated in NUREG-1801, Revision 2, Section XI.E2, industry operating experience has identified a case where a change in temperature across a high-range radiation monitor cable in containment resulted in substantial change in the reading of the monitor. Changes in instrument calibration can be caused by degradation of the circuit cable and are a possible indication of electrical cable degradation. The vast majority of industry operating experience regarding neutron flux instrumentation circuits is related to cable/connector issues inside containment near the reactor vessel. A search of WF3 operating experience identified no age-related failures of excore and radiation monitoring system cables and connections at WF3.

As discussed in element 10 to NUREG-1801, Section XI.E2, this program considers the technical information and industry operating experience provided in NUREG/CR-5643, IEEE Std. 1205-2000, SAND96-0344, EPRI TR-109619, NRC IN 97-45, and NRC IN 97-45, Supplement 1.

The WF3 program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Non-EQ Sensitive Instrumentation Circuits Test Review Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.26 NON-EQ INSULATED CABLES AND CONNECTIONS

Program Description

The Non-EQ Insulated Cables and Connections Program is a new condition monitoring program that provides reasonable assurance the intended functions of insulated cables and connections exposed to adverse localized environments caused by heat, radiation and moisture can be maintained consistent with the current licensing basis through the period of extended operation. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the plant design environment for the cable or connection insulation materials.

Accessible insulated cables and connections within the scope of license renewal installed in an adverse localized environment will be visually inspected for cable and connection jacket surface anomalies, such as embrittlement, discoloration, cracking, melting, swelling, or surface contamination, indicating signs of reduced insulation resistance. The program sample consists of all accessible cables and connections in localized adverse environments. This program sample of accessible cables will represent, with reasonable assurance, all cables and connections in the adverse localized environment.

An adverse localized environment is a plant-specific condition that will be determined based on the most limiting temperature, radiation, or moisture conditions for the cables and connection insulation material located at WF3 within a plant space. Adverse localized environments can be identified through the use of an integrated approach. This approach may include, but is not limited to, (a) the review of Environmental Qualification (EQ) zone maps that show radiation levels and temperatures for various plant areas, (b) consultations with plant staff who are cognizant of plant conditions, (c) utilization of infrared thermography to identify hot spots on a real-time basis, and (d) the review of relevant plant-specific and industry operating experience. In addition, a survey method focused on plant-wide areas to determine potential adverse localized environments could be used.

This program will visually inspect accessible cables in an adverse localized environment at least once every 10 years, with the first inspection prior to the period of extended operation.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Insulated Cables and Connections Program will be consistent with the program described in NUREG-1801, Section XI.E1, Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Insulated Cables and Connections Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations and will be factored into the program via the confirmation and corrective action elements of the WF3 10 CFR 50 Appendix B quality assurance program.

A search of site-specific operating experience found no aging mechanisms not considered in NUREG-1801.

As discussed in element 10 to NUREG-1801, Section XI.E1, this program considers the technical information and industry operating experience provided in NUREG/CR-5643, IEEE Std. 1205-2000, SAND96-0344, and EPRI TR-109619.

The WF3 program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. The examination techniques used in this program to detect aging effects are proven industry techniques that have been effectively used at WF3 in other programs. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Non-EQ Insulated Cables and Connections Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.27 OIL ANALYSIS

Program Description

The Oil Analysis Program ensures that loss of material and reduction of heat transfer are not occurring by maintaining the quality of the lubricating oil. The program ensures that contaminants (primarily water and particulates) are within acceptable limits. Testing activities include sampling and analysis of lubricating oil for contaminants. Oil testing results that indicate the presence of water initiate corrective action that may include evaluating for in-leakage.

The One-Time Inspection Program (Section B.1.28) will use inspections or nondestructive evaluations of representative samples to verify that the Oil Analysis Program has been effective at managing the aging effects of loss of material and reduction of heat transfer.

NUREG-1801 Consistency

The Oil Analysis Program is consistent with the program described in NUREG-1801, Section XI.M39, Lubricating Oil Analysis.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Oil Analysis Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In December 2008, Waterford 3 personnel identified that the differential pressure across in-service feed water pump turbine high pressure lube oil filter exceeded the alert limit of 15 psid. Previous lube oil samples taken were analyzed. Water content was determined to be acceptable at the time of sampling. An action to install a new filter element was completed.

- In May 2011, high water content was identified in feedwater pump turbine (FWPT) lube oil. The lube oil sight glass was found cloudy, and differential pressure across the high pressure filter was rising. Predictive maintenance personnel collected an oil sample from the FWPT lube oil reservoir and analyzed for water content. Actions were completed to remove water from the FWPT lube oil and to replace the lube oil filters.

- In May 2013, elevated particulate and water levels were identified in the dry cooling tower fan gearbox oil. Maintenance personnel changed the oil and flushed the gearbox to resolve the condition.

The Oil Analysis Program has been effective at maintaining oil quality at Waterford 3. Negative trends in oil sample results have been adequately documented, and out-of-specification oil has been replaced as necessary.

The identification of degradation and initiation of corrective action prior to loss of intended function provide reasonable assurance that the Oil Analysis Program will remain effective. The continued application of proven sampling methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Oil Analysis Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.28 ONE-TIME INSPECTION

Program Description

The One-Time Inspection Program is a new program that will use inspections that verify unacceptable degradation is not occurring or is minimized to the extent that a loss of intended function will not occur during the period of extended operation. The program consists of a one-time inspection of selected components to accomplish the following:

- Verify the effectiveness of an aging management program that is designed to prevent or minimize the effects of aging to the extent that they will not cause the loss of intended function during the period of extended operation. The aging effects evaluated are loss of material, cracking, and reduction of heat transfer due to fouling.
- Confirm the insignificance of an aging effect for situations in which additional confirmation is appropriate using inspections that verify unacceptable degradation is not occurring.
- Trigger additional actions if necessary to ensure the intended functions of affected components are maintained during the period of extended operation.

The sample size will be 20 percent of the components in each material-environment-aging effect group up to a maximum of 25 components. Identification of inspection locations will be based on the potential for the aging effect to occur. Examination techniques will be established NDE methods with a demonstrated history of effectiveness in detecting the aging effect of concern, including visual, ultrasonic, and surface techniques. Acceptance criteria will be based on applicable ASME or other appropriate standards, design basis information, or vendor-specified requirements and recommendations. Any indication or relevant condition will be evaluated. The need for follow-up examinations will be evaluated based on inspection results.

The One-Time Inspection Program will not be used for structures or components with known age-related degradation mechanisms or when the environment in the period of extended operation is not expected to be equivalent to that in the prior 40 years. In these cases a periodic plant-specific inspection will be performed.

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below.

Water Chemistry Control – Primary and Secondary Program (Section B.1.41)	One-time inspection activity will verify the effectiveness of the Water Chemistry Control – Primary and Secondary Program by confirming that unacceptable cracking, loss of material, and reduction of heat transfer is not occurring.

Oil Analysis Program (Section B.1.27)	One-time inspection activity will verify the effectiveness of the Oil Analysis Program by confirming that unacceptable cracking, loss of material, and reduction of heat transfer is not occurring.
Diesel Fuel Monitoring Program (Section B.1.8)	One-time inspection activity will verify the effectiveness of the Diesel Fuel Monitoring Program by confirming that unacceptable loss of material or reduction of heat transfer due to fouling is not occurring.
Reactor vessel flange leak detection line	One-time inspection activity will confirm that cracking and loss of material are not occurring or are so insignificant that a plant-specific aging management program is not warranted.
Circulating water intake piping (reinforced concrete portions)	One-time inspection activity will confirm that change in material properties, loss of material and cracking are not occurring or are so insignificant that a plant-specific aging management program is not warranted.

The inspections will be performed prior to the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection Program will be consistent with the program described in NUREG-1801, Section XI.M32, One-Time Inspection.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection Program is a new program. Industry operating experience will be considered in the implementation of this program.

This inspection program applies to potential aging effects for which there is no operating experience at Waterford 3 indicating the need for an aging management program. As stated in NUREG-1801, Revision 2, Section XI.M32, the elements of these inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and use developed and proven industry techniques for inspection such as ultrasonic testing and visual exams. These techniques have also been proven effective for detection of aging effects outside of this program, as documented in operating experience for other programs such as the Flow-Accelerated Corrosion (Section B.1.14) and Inservice Inspection (Section B.1.15) programs.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The One-Time Inspection Program provides reasonable assurance that the Diesel Fuel Monitoring Program (Section B.1.8), Oil Analysis Program (Section B.1.27), and Water Chemistry Control – Primary and Secondary Program (Section B.1.41) will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation. The program also provides reasonable assurance of the absence or insignificance of certain aging effects that are not expected to be significant during the period of extended operation.

B.1.29 ONE-TIME INSPECTION – SMALL-BORE PIPING

Program Description

The One-Time Inspection – Small-Bore Piping Program is a new program that augments ASME Code, Section XI requirements and is applicable to small-bore ASME Code Class 1 piping and components with a nominal pipe size diameter less than 4 inches (NPS < 4) and greater than or equal to NPS 1 in systems that have not experienced cracking of ASME Code Class 1 small-bore piping. The program can also be used for systems that have experienced cracking but have implemented design changes to effectively mitigate cracking. WF3 has not experienced cracking of ASME Code Class 1 small-bore piping due to stress corrosion, cyclical (including thermal, mechanical, and vibration fatigue) loading, or thermal stratification and thermal turbulence.

Since WF3 has an extensive operating history (i.e., greater than 30 years), this program provides a one-time volumetric or opportunistic destructive inspection of a 3-percent sample or maximum of 10 ASME Class 1 piping butt weld locations and a 3-percent sample or a maximum of 10 ASME Class 1 socket weld locations that are susceptible to cracking. Volumetric examinations are performed using a demonstrated technique that is capable of detecting the aging effects in the volume of interest. In the event the opportunity arises to perform a destructive examination of an ASME Class 1 small-bore socket weld that meets the susceptibility criteria, then the program takes credit for two volumetric examinations. The program includes pipes, fittings, branch connections, and full and partial penetration welds.

This program includes a sampling approach. Sample selection is based on susceptibility to stress corrosion, cyclic loading (including thermal, mechanical, and vibration fatigue), thermal stratification, thermal turbulence, dose considerations, operating experience, and limiting locations of total population of ASME Class 1 small-bore piping locations.

The program includes measures to verify that degradation is not occurring, thereby either confirming that there is no need to manage age-related degradation or validating the effectiveness of any existing program for the period of extended operation. If evidence of cracking is revealed by this one-time inspection, it will be entered into the corrective action program to determine extent of condition, and a follow-up periodic inspection will be managed by a plant-specific program.

The inspection will be performed within the six years prior to the period of extended operation.

NUREG-1801 Consistency

The One-Time Inspection – Small-Bore Piping Program will be consistent with the program described in NUREG-1801, Section XI.M35, One-Time Inspection of ASME Code Class 1 Small-Bore Piping Program.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The One-Time Inspection – Small Bore Piping Program is a new program. Industry operating experience will be considered in the implementation of this program.

Waterford 3 has not experienced cracking of ASME Code Class 1 small-bore piping less than NPS 4 and greater than or equal to NPS 1 due to stress corrosion, cyclical (including thermal, mechanical, and vibration fatigue) loading, or thermal stratification and thermal turbulence.

As stated in NUREG-1801, Revision 2, Section XI.M35, this program uses volumetric inspection techniques with demonstrated capability to detect cracking in piping weld and base material. Accordingly, there is reasonable assurance that this new aging management program will be effective.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The One-Time Inspection – Small-Bore Piping Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.30 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance (PSPM) Program includes periodic inspections and tests to manage aging effects not managed by other aging management programs, including change in material properties, cracking, loss of material, and reduction of heat transfer.

Inspections occur at least once every 5 years during the period of extended operation.

Credit for program activities has been taken in the aging management review of systems, structures and components as described below.

System	Inspection
Plant drains	Perform a visual inspection of the surface condition of a representative sample of the submersible sump pumps and the back-up pumps for the dry cooling towers.
Emergency generator system	Perform a visual inspection of the surface condition of a representative sample of EDG cooler heat exchanger tubes to manage loss of material due to wear. Monitor the surface condition of the expansion joint to verify the absence of cracking due to stress corrosion/IGA.
Component cooling and auxiliary component cooling water system	Use visual or other NDE techniques to inspect a representative sample of the tubes and fins of the CCW dry cooling tower radiator to manage loss of material and fouling that could result in a reduction of heat transfer capability. Perform a visual inspection of the internal surface of the portable UHS replenishment pump casing to manage loss of material.
RCP oil collection (RCPOC)	Visually inspect the inside surface of RCP oil collection components (representative samples) in an environment of waste lube oil to manage loss of material.
Control room HVAC	Visually inspect the internal and external surfaces of the carbon steel portable smoke removal fan and smoke-ejector duct to manage cracking, loss of material due to wear, and change in material properties.

System	Inspection
Nonsafety-related systems and components affecting safety-related systems, representative samples of abandoned equipment in these systems	Visually inspect the internal surface of piping, filter housings and valve bodies in the radiation monitoring (ARM, PRM) system to manage loss of material. Visually inspect the internal surface of flow elements, piping, sight glasses, traps and valve bodies in the auxiliary steam (AS) system to manage loss of material. Visually inspect the internal surface of accumulators, filter housings, piping, pump casings, and valve bodies in the blowdown (BD) system to manage loss of material. Visually inspect the internal surface of piping, pump casings, tanks, traps, and valve bodies in the boron management (BM) system to manage loss of material. Visually inspect the internal surface of piping, and valve bodies in the condensate (CD) system to manage loss of material. Visually inspect the internal surface of piping, and valve bodies in the chemical feed (CF) system to manage loss of material. Visually inspect the internal surface of piping and valve bodies in the chilled water (CHW) system to manage loss of material. Visually inspect the internal surface of piping in the emergency diesel cooling (EG, EGA, EGC, EGF, EGL) system to manage loss of material. Visually inspect the internal surface of piping in the fuel pool cooling and purification (FS) system to manage loss of material. Visually inspect the internal surface of condenser (shell), cooler (housing), evaporator, piping and valve bodies in the liquid waste management (LWM) system to manage loss of material. Visually inspect the internal surface of piping and valve bodies in the steam generator (SG) system to manage loss of material. Visually inspect the internal surface of accumulators, piping, pump casings, tanks and valve bodies in the solid waste management (SWM) system to manage loss of material. Visually inspect the internal surface of piping in the secondary sampling (SSL) system to manage loss of material.

Evaluation

1. Scope of Program

The Periodic Surveillance and Preventive Maintenance Program, with regard to license renewal, includes the specific structures and components identified in the aging management reviews as listed in the table above.

2. Preventive Actions

Similar to other condition monitoring programs described in NUREG-1801, the Periodic Surveillance and Preventive Maintenance Program does not include preventive actions.

3. Parameters Monitored/Inspected

The Periodic Surveillance and Preventive Maintenance Program monitors and inspects parameters linked to the degradation of the particular structure or component. For example, surface conditions of metallic components are monitored for loss of material, fouling that could result in a reduction of heat transfer capability, cracking, and worn or flaking surfaces, while polymeric components are inspected for cracking, crazing, scuffing, dimensional changes, discoloration and hardening as evidenced by loss of suppleness.

For selected piping components, wall thickness is measured to determine the extent of corrosion caused by recurring internal corrosion mechanisms.

4. Detection of Aging Effects

Periodic surveillance and preventive maintenance activities provide for periodic component inspections and testing to detect aging effects. Inspection and test intervals are established such that they provide timely detection of degradation prior to loss of intended functions. Inspection and test intervals, sample sizes, and data collection methods are dependent on component material and environment, biased toward locations most susceptible to aging, and derived with consideration of industry and plant-specific operating experience and manufacturers’ recommendations.

Established techniques such as visual inspections are used. Each inspection or test occurs at least once every 5 years. Inspections are performed by personnel qualified to perform the selected technique.

For each activity listed above that refers to a representative sample, a representative sample is 20 percent of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components.

5. Monitoring and Trending

Periodic surveillance and preventive maintenance activities provide for monitoring and trending of age-related degradation. Inspection and testing intervals are established such that they provide for timely detection of component degradation. Inspection intervals are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations.

6. Acceptance Criteria

Periodic Surveillance and Preventive Maintenance Program acceptance criteria are defined in specific inspection procedures. The acceptance criterion is no indication of relevant degradation, and any identified degradation is evaluated.

7. Corrective Actions

Corrective actions, including root cause determination and prevention of recurrence, are implemented in accordance with requirements of 10 CFR Part 50, Appendix B. Any indication or relevant condition of degradation detected is evaluated.

8. Confirmation Process

This element is discussed in Section B.0.3.

9. Administrative Controls

This element is discussed in Section B.0.3.

10. Operating Experience

The following operating experience provides objective evidence that the PSPM Program will be effective in managing the effects of aging by identifying problems, initiating corrective action, and implementing program improvements.

- In 2009, a quality assurance audit evaluated work control system action requests to add, change or delete preventive maintenance (PM) tasks for compliance with procedural requirements and adequacy of documentation. Recent PM tasks were reviewed and found to contain documentation of appropriate and timely feedback from the field.

- In 2011, Waterford 3 performed a quality assurance audit on the PM program. One condition was identified regarding an administrative issue involving a PM surveillance record that did not contain an image in the document retrieval system. The appropriate personnel corrected the condition.

- In 2013, a quality assurance audit evaluated various aspects of the PM program. Auditors found that both maintenance and engineering personnel used WF3 and industry operating experience to improve the evaluation of components and systems in the PM program. The audit concluded that applicable procedures provided adequate guidance and direction for the performance and documentation of PM tasks for high, low and non-critical components.

- In May 2013, an industry organization peer review found that misclassification and incorrect PM strategies for ultimate heat sink components and air-operated valves contributed to equipment failures that resulted in safety system unavailability and a downpower. Contributing to this, engineering managers did not review some subcomponent classifications effectively. All corrective actions were verified to be complete and adequate to resolve the condition.

- In February 2015, Waterford 3 personnel documented a finding in an NRC integrated inspection report. Specifically, a PM schedule to inspect all portions of the dry cooling towers was not developed. The specific conditions identified in this condition report were corrected.

The identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the PSPM Program will remain effective. The continued application of proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program 3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Revise PSPM Program procedures as necessary to incorporate the activities listed in the above table.
6. Acceptance Criteria	Revise the PSPM Program procedures to state that the acceptance criterion is no indication of relevant degradation and such indications will be evaluated.

Conclusion

The Periodic Surveillance and Preventive Maintenance Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.31 PROTECTIVE COATING MONITORING AND MAINTENANCE

Program Description

The Protective Coating Monitoring and Maintenance Program manages the effects of aging on Service Level I coatings applied to external surfaces of carbon steel and concrete inside containment (e.g., steel containment vessel shell, structural steel, supports, penetrations, and concrete walls and floors). The Protective Coating Monitoring and Maintenance Program meets the technical basis of ASTM D 5163-08. The program provides an effective method to assess coating condition through visual inspections by identifying degraded or damaged coatings and providing a means for repair of identified problem areas.

Service Level I protective coatings are not credited to manage the effects of aging. Proper monitoring and maintenance of protective coatings inside containment ensures operability of post-accident safety systems that rely on water recycled through the containment. The proper monitoring and maintenance of Service Level I coatings ensures there is no coating degradation that would impact safety functions, for example, by clogging emergency core cooling system suction strainers.

NUREG-1801 Consistency

The Protective Coating Monitoring and Maintenance Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.S8, Protective Coating Monitoring and Maintenance Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise plant procedures to specify visual inspections of coatings near sumps or screens associated with the emergency core cooling system.

Operating Experience

The following operating experience provides objective evidence that the Protective Coating Monitoring and Maintenance Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In 2006, inspections of Service Level I coatings inside the steel containment vessel were performed. Coating failures were found on the steel containment vessel wall, dome, and polar crane ring girder. The failure mechanism was splitting of the primer topcoat, leaving the base primer on the substrate. These coating failures were documented and determined to be acceptable.

- Inspections of Service Level I coatings inside containment were performed in accordance with WF3 coating inspection procedure during the 2011 refueling outage. Coating failures were found on containment vessel wall, dome and polar crane ring girder. The majority of containment coating failures observed had been previously observed during earlier visual inspections. These failures were determined acceptable based on the amount of failed coatings assumed for the design analysis of the safety injection sump screen.

- The total area of coating failures during the 2012 refueling outage visual inspections showed a slight increase from the previous inspection. The majority of containment coating failures had been previously observed during earlier visual inspections. The quantity of failed coating was determined acceptable based on the assumed quantity of failed coating used in the design analysis of the safety injection sump screen.

- The total area of failure identified during the 2014 refueling outage visual inspections showed a 2.2 percent increase in total area of failed coatings over that observed in the previous outage inspection. The majority of containment coating failures had been previously observed during earlier visual inspections The quantity of failed coating was determined acceptable based on the assumed quantity of failed coating used in the design analysis of the safety injection sump screen.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrate that the Protective Coating Monitoring and Maintenance Program has been effective. The continued use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Protective Coating Monitoring and Maintenance Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.32 REACTOR HEAD CLOSURE STUDS

Program Description

The Reactor Head Closure Studs Program manages cracking and loss of material due to wear or corrosion for reactor head closure stud bolting (studs, washers, and nuts) using inservice inspection (ASME Section XI 2001 Edition 2003 Addendum Table IWB-2500-1) and preventive measures to mitigate cracking. Preventive actions include avoiding the use of metal-plated stud bolting, use of an acceptable surface treatment, use of stable lubricants, and use of bolting material that has actual yield strength of less than 150 ksi for all studs. The program detects cracks, loss of material and leakage using visual, surface and volumetric examinations as required by ASME Section XI. The program also relies on recommendations to address reactor head closure studs degradation listed in NUREG-1339 and NRC RG 1.65.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M3, Reactor Head Closure Stud Bolting.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
2. Preventive Actions	Revise Reactor Head Closure Studs Program procedures to ensure that replacement studs are fabricated from bolting material with actual measured yield strength less than 150 kilo-pounds per square inch.
2. Preventive Actions	Revise Reactor Head Closure Studs Program procedures to exclude the use of molybdenum disulfide (MoS_2) on the reactor vessel closure studs and refer to RG 1.65, Rev. 1.

Operating Experience

The following operating experience provides objective evidence that the Reactor Head Closure Studs Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In November 2009, Waterford 3 personnel documented indications of wastage of the outside of the reactor head seating surface between studs 8 and 9. The identified condition resulted from a leak that occurred in 1992. The extent of the corrosion was unchanged from previous observations. No active leak was identified and the conclusions of acceptability resulting from previous evaluations remained valid.

As discussed in element 10 to NUREG-1801, Section XI.M3, this program considers the technical information and industry operating experience provided in NRC IE Bulletin 82-02 and NRC GL 91-17.

Inspections on the reactor vessel closure studs are performed in accordance with program requirements. The inspections have identified no history of degradation. Although there have been no deficiencies noted in the past 10 years of inspection activity for this program, the continued use of proven inspection methods and preventive measures provides reasonable assurance that the Reactor Head Closure Studs Program will remain effective through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Reactor Head Closure Studs Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.33 REACTOR VESSEL INTERNALS

Program Description

The Reactor Vessel Internals Program implements the Electric Power Research Institute (EPRI) Technical Report N0. 1022863, “Materials Reliability Program: Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines” (MRP-227-A), and EPRI Technical Report No. 1016609, “Materials Reliability Program: Inspection Standard for PWR Internals” (MRP-228), as described in the inspection plan submitted to the NRC December 16, 2013 (W3F1-2013-007), to manage the aging effects on the WF3 RVI components. WF3 is a CE Nuclear Steam Supply System (NSSS) design. The recommended activities in MRP-227-A and additional plant-specific activities not defined in MRP-227-A are implemented in accordance with Nuclear Energy Institute (NEI) 03-08, “Guideline for the Management of Materials Issues.”

This program is used to manage cracking, loss of material due to wear, reduction in fracture toughness, change in dimension, and loss of preload for reactor vessel internal components intended to provide core support. The program applies the guidance in MRP-227-A for inspecting, evaluating and, if applicable, dispositioning non-conforming RVI components. The program includes expanding periodic examinations and other inspections, if the extent of the degradation identified exceeds the expected levels.

The sample selection process consisted of categorizing reactor vessel internal components into four sets: (1) a set of primary internals component locations for the WF3 RVI design that are expected to show leading indications of the degradation effects, (2) a set of expansion internals component locations that are specified to expand the sample should the indications be more severe than anticipated, (3) a set of internals locations that are deemed to be adequately managed by existing programs, such as American Society of Mechanical Engineers (ASME) Code Section XI Examination Category B-N-3, examinations of core support structures, and (4) a set of internal locations that are deemed to require no additional measures. This process used appropriate component functionality criteria, age-related degradation susceptibility criteria, and failure consequences criteria to identify the components that will be inspected under the program. Consequently, the sample selection process is adequate to assure that the intended functions of the reactor internal components are maintained during the period of extended operation.

In LRA Table 3.1.2-2, Reactor Vessel Internals—Summary of Aging Management Evaluation, parenthetical notes are used on rows of the table to indicate the relevant Reactor Vessel Internals Program inspection groups for the components:

- (P) indicates a primary component.
- (E) indicates an expansion component.

- (X) indicates the component is in an existing program.
- (N) indicates no additional measures are needed.

NUREG-1801 Consistency

The Reactor Vessel Internals Program, with enhancement, will be consistent with the program described in NUREG-1801, Section XI.M16A, PWR Vessels Internals Program as revised by LR-ISG-2011-04, Updated Aging Management Criteria for Reactor Vessel Internal Components for Pressurized Water Reactors.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise Reactor Vessel Internals Program procedures to include the inspections identified in the inspection plan in NRC submittal W3F1-2013-0070, dated December 16, 2013, including the inspection of the core stabilizing bolts as an addition to the WF3 ASME Section XI In-Service Inspection Program.

Operating Experience

The following operating experience provides objective evidence that the Reactor Vessel Internals Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In November 2003, during the performance of ISI visual examination of reactor vessel internals, several small particles of an unknown material were noted in the water and on the surfaces being examined. A similar amount of the same small particles were noted by a review of previous outage videotape. Engineering personnel concluded that these particles would not interfere with control rod motion or result in blockage of coolant flow through fuel. No actions beyond trending were recommended.
- In November 2003, measurements taken of the position of the In-Core Instrument (ICI) stalks indicated that ICI thimble growth caused the ICI plate and instrument guide path to be slightly elevated within the reactor vessel internals. These measurements indicated

that ICI thimble growth will need to be addressed during the next refueling outage. This condition was anticipated and a modification to address this condition was installed.

- In November 2009, video inspection of ICIs identified that one thimble assembly was bent and the Zircaloy thimble section was cracked. ICI and thimble were bent between the thimble support plate and the fuel alignment plate. This condition was attributed to inadequate evaluation of the effect of thimble growth on maintenance and refueling activities. Actions completed included removal of the thimble, determination that operation without this detector is acceptable, and conclusion that debris from the thimble assembly had no adverse impact.

- In November 2009, while observing fuel movement on the refuel machine, two anomalies were noted concerning the core support barrel:

  - Discoloration was noted around the specimen capsule access holes.

  - At the core support barrel lift rig bolt hole on the east side at the ~100 degree position, a discolored line identified as a possible crack was observed between the hole and the edge of the core support barrel.

  The areas of discoloration were examined. No erosion or corrosion was identified. The indication identified as a possible crack was examined and determined to be a machined area around the lift rig hole with four smaller holes at 90-degree intervals. The NDE level III examiner determined that there is no crack present, and the area identified was determined to have no relevant indications and no conditions adverse to quality. This example indicates program effectiveness in identifying minor indications prior to degradation that results in loss of intended function

As discussed in element 10 to NUREG-1801, Section XI.M16A, this program considers the technical information and industry operating experience provided in NEI 03-08 and MRP-227-A.

The effectiveness of these proven inspection techniques throughout the industry provides reasonable assurance that the Reactor Vessel Internals Program will be effective. The application of these proven techniques provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Reactor Vessel Internals Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.34 REACTOR VESSEL SURVEILLANCE

Program Description

The Reactor Vessel Surveillance Program manages reduction of fracture toughness and long-term operating conditions for reactor vessel beltline materials using material data and dosimetry. The program includes all reactor vessel beltline materials as defined by 10 CFR 50 Appendix G, Section II.F, and complies with 10 CFR 50, Appendix H for vessel material surveillance.

The objective of the Reactor Vessel Surveillance Program is to provide sufficient material data and dosimetry to (a) monitor irradiation embrittlement at the end of the period of extended operation and (b) establish operating restrictions on the inlet temperature, neutron spectrum, and neutron flux after a surveillance capsule is withdrawn for testing. If surveillance capsules are not withdrawn during the period of extended operation, operating restrictions are specified to ensure that the plant is operated under the conditions to which the surveillance capsules were exposed. Capsules removed from the reactor vessel are tested and reported in accordance with ASTM E 185-82 to the extent practicable for the configuration of the specimens in the capsule. Capsules are periodically withdrawn from the reactor vessel in accordance with an NRC-approved withdrawal schedule. One capsule will be withdrawn during an outage in which the capsule receives a neutron fluence of between one and two times the peak reactor vessel wall neutron fluence at the end of the period of extended operation.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Reactor Vessel Surveillance Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In March 2003, a surveillance specimen was removed and examined in accordance with the surveillance program. A report was produced that documented the testing and fluence analysis results associated with this specimen.

- In March 2015, a surveillance specimen was removed and examined in accordance with the surveillance program. A report was produced that documented the testing and fluence analysis results associated with this specimen. The report contained an evaluation that beltline material properties remain acceptable to support continued safe plant operations through 32 EFPY.

The material testing and analysis provides reasonable assurance that the Reactor Vessel Surveillance Program will remain effective. The application of these proven methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Reactor Vessel Surveillance Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.35 SELECTIVE LEACHING

Program Description

The Selective Leaching Program is a new program that will demonstrate the absence of selective leaching in a selected sample of components (i.e., 20 percent of the population with maximum of 25 components) fabricated from gray cast iron and copper alloys (except for inhibited brass) that contain greater than 15 percent zinc or greater than 8 percent aluminum in an environment of condensation, raw water, waste water, treated water, or soil. A sample population is defined as components with the same material and environment combination. Where practical the sample population will focus on components most susceptible to aging due to time in service, severity of operating condition, and lowest design margin. The program will include a one-time visual inspection of selected components coupled with hardness measurement or other mechanical examination techniques such as destructive testing, scraping or chipping to determine whether loss of material is occurring due to selective leaching that may affect the ability of a component to perform its intended function through the period of extended operation.

For buried components with coatings no selective leaching inspections are necessary where coating degradation has not been identified. For buried components with degraded coating or no coatings, the sample size is 20 percent of the population up to a maximum of 25 components. If only minor coating damage has been identified, the sample size may be reduced to 5 percent of the population with a maximum of 6 components. Minor coating degradation is defined as (a) there were no more than 2 instances of degradation identified in the 10-year period prior to the period of extended operation, and (b) the pipe could be shown to meet unreinforced opening criteria of the applicable piping code when assuming the pipe surface affected by the coating degradation is a through-wall hole.

Follow-up for unacceptable inspection findings includes an evaluation using the corrective action program and possible expansion of the inspection sample size and location.

The inspection will be performed prior to the period of extended operation.

NUREG-1801 Consistency

The Selective Leaching Program will be consistent with the program described in NUREG-1801, Section XI.M33, Selective Leaching of Materials, as modified by LR-ISG-2011-03, Changes to the Generic Lessons Learned (GALL) Report Revision 2 Aging Management Program XI.M41, “Buried and Underground Piping and Tanks.”

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Selective Leaching Program is a new program. Industry operating experience will be considered during implementation of this program. Plant operating experience will be gained as the program is executed and will be factored into the program via the confirmation and corrective action elements of the WF3 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to potential aging effects for which there is no operating experience at Waterford 3 indicating the need for an aging management program. The review of operating experience at Waterford 3 identified no occurrence of selective leaching. As stated in NUREG-1801, Revision 2, Section XI.M33, the inspection elements of this program (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice. Accordingly, there is reasonable assurance that this new aging management program will be effective.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Selective Leaching Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.36 SERVICE WATER INTEGRITY

Program Description

The Service Water Integrity Program manages loss of material and reduction of heat transfer for components fabricated from materials such as carbon steel, copper alloy, gray cast iron, or stainless steel, and in an environment of raw water as described in the WF3 response to NRC GL 89-13. The program includes (a) surveillance and control techniques to manage effects of biofouling, corrosion, erosion, and silting; (b) tests to verify heat transfer capability of heat exchangers important to safety; (c) system walkdowns to ensure compliance with the licensing basis; (d) routine inspections and maintenance; and (e) review of maintenance, operating and training practices and procedures.

NUREG-1801 Consistency

The Service Water Integrity Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System, as modified by LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
2. Preventive Actions	Revise Service Water Integrity Program procedures to (1) flush redundant, infrequently flowed sections, and stagnant lines to ensure there is no blockage, and (2) inspect selected low flow or stagnant areas and system low points such as drains.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Revise Service Water Integrity Program procedures to monitor the ACCW basins for biological fouling by visual inspection as well as analysis of water for biological activity.

Operating Experience

The following operating experience provides objective evidence that the Service Water Integrity Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

The Service Water Integrity Program was established to ensure the reliability of safety-related service water system components in accordance with provisions of GL 89-13. Operating experience is used to ensure ongoing program effectiveness as demonstrated by the following.

- In 2008, a focused assessment of the ultimate heat sink (UHS) was performed. The scope of this assessment was to verify that the design bases were correctly implemented for the UHS and to ensure that the system functional requirements were met. No compliance issues were noted during this assessment. Actions were completed to address weaknesses including timeliness of return to service following modifications, creation of inspection and cleaning PM activities, and timeliness of corrective actions.

- In November 2006, a condition report was initiated to document the Waterford 3 response to INPO issued Significant Event Report (SER) 7-06, “Degradation of Essential Service Water Piping.” The SER focused on piping degradation as well as other service water equipment problems, such as debris intrusion and intake system blockage. The ACCW system at WF3 is identified as the “service water system” with respect to NRC GL 89-13. The ACCW, an open-cycle recirculation system which does not utilize raw water, was determined not subject to the issues described in this SER. The subject SER was reviewed and the salient issues were addressed within the WF3 GL 89-13 program.

- In October 2008, an ultimate heat sink assessment identified a weakness in the Waterford 3 GL 89-13 program involving confusion in the component testing intervals. Actions were completed to address the weakness, including actions to track completion of component cooling water heat exchanger testing (both trains).

- In December 2010, during the INPO assessment, a weakness was identified in how the required periodic actions for SOER 07-2, “Intake Cooling Water Blockage,” are tracked. The tracking method and guidance were not adequate to ensure that required future periodic reviews meet the intent of the SOER. Corrective action was completed to address this condition, including updating the SOER 07-2 response. The summer reliability action template was revised to specifically require a review to meet the intent of SOER 07-2, including a review of environmental changes that could impact the intake structure and the UHS.

As discussed in element 10 to NUREG-1801, Section XI.M20, this program considers the technical information and industry operating experience provided in NRC IN 85-30, IN 07-06, IN 85-24, IN 81-21, IN 86-96, IN 07-04, IN 07-28 and NRC GL 89-13.

The identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the Service Water Integrity Program will remain effective. The continued application of proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Service Water Integrity Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.37 STEAM GENERATOR INTEGRITY

Program Description

The Steam Generator Integrity Program manages aging effects for the steam generator tubes, plugs, sleeves, and secondary side components contained within the steam generator in accordance with the plant technical specifications and commitments to NEI 97-06. Preventive and mitigative measures include foreign material exclusion programs and other primary and secondary side maintenance activities, such as sludge lancing and inspecting any installed plugs and replacing them with updated materials as needed. The program has acceptance criteria for when a tube should be plugged based on wall thickness measurements.

Steam generator water chemistry is monitored and maintained in accordance with the Water Chemistry Control – Primary and Secondary Program. The thermally treated Alloy 690 tubes are monitored for wear based on industry experience using inspection techniques capable of detecting the aging effect. The general conditions of components (e.g., plugs when installed, sleeves, and other secondary side components) are monitored visually. In the event degradation is noted, the corrective action program drives a more detailed inspection. The inspections are performed by qualified personnel using qualified techniques in accordance with approved station procedures. In addition, primary-to-secondary leak rates are monitored as a potential indicator of steam generator tube integrity. Condition monitoring assessments are performed and documented in accordance with site-approved procedures to confirm that adequate tube integrity has been maintained since the previous inspection. Operational assessments are performed to ensure the tube integrity will be maintained until the next scheduled inspection. The acceptance criteria are in accordance with technical specifications.

NUREG-1801 Consistency

The Steam Generator Integrity Program is consistent with the program described in NUREG-1801, Section XI.M19, Steam Generator.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Steam Generator Integrity Program will be effective in ensuring that applicable component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In 2006, a steam generator management program focused assessment was performed. The purpose of this assessment was to determine if the W3 Steam Generator Management Program (SGMP) implemented the requirements of NEI 97-06, “Steam Generator Program Guidelines.” The assessment team evaluated compliance with the EPRI Guidelines: PWR SG Examination Guidelines, SG Integrity Assessment Guidelines, and SG In-situ Pressure Test Guidelines.

  The team determined that program compliance is satisfactory and improving. No major program weaknesses were identified. However, two areas for improvement were identified, including the need to revise the governing procedure to require a detailed work scope review prior to issuing the SG eddy current contract. The procedure was revised as documented in the corrective action program.

- During video inspection of steam generators in May 2008, a piece of broken batwing segment was found lodged between the row 1 and row 2 tubes near the 8^{th} tube support plate. This condition was evaluated as acceptable.

- In April 2011, steam generator eddy current inspection identified a loose part stuck in tube. The loose part was successfully removed. The tube was eddy current tested, found satisfactory, and left in service.

- A review of the 2012–2014 Waterford 3 steam generator management program health report indicated that the overall health of the program made a discreet improvement from degraded to acceptable following replacement of the steam generators.

As discussed in element 10 to NUREG-1801, Section XI.M19, this program considers the technical information and industry operating experience provided in NEI 97-06, ASME Code Section XI, and 10 CFR 50.65.

The identification of degradation and initiation of corrective action prior to loss of intended function provides reasonable assurance that the Steam Generator Integrity Program will remain effective. The application of these proven methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Steam Generator Integrity Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.38 STRUCTURES MONITORING

Program Description

The Structures Monitoring Program manages the effects of aging on structures and structural components, including structural bolting, within the scope of license renewal. The program was developed based on guidance in RG 1.160, Revision 2, "Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," and NUMARC 93-01, Revision 2, "Industry Guidelines for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," to satisfy the requirement of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants." The scope of the Structures Monitoring Program includes structures within the scope of license renewal as delineated in 10 CFR 54.4.

The structures and structural components are inspected by qualified personnel. Concrete structures are inspected for indications of deterioration and distress, using guidelines provided in ACI 201.1R, "Guide for Making a Condition Survey of Existing Buildings," and ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures." Elastomers will be monitored for hardening, shrinkage and loss of sealing. Component supports will be inspected for loss of material and reduction in anchor capacity due to local concrete degradation. Exposed surfaces of bolting are monitored for loss of material, loose or missing nuts, missing bolts, or other indications of loss of preload. The program includes plant procedures to ensure that the selection of bolting material, installation torque or tension, and lubricants and sealants are appropriate for the intended purpose. The program includes preventive actions delineated in NUREG-1339 and in EPRI NP-5769, NP-5067, and TR-104213 to ensure structural bolting integrity, which includes proper specification of bolting material, lubricant, and installation torque.

Inspection frequency of structures ensure that inspections are performed at a frequency of at least once every 5 years to ensure there is no loss of intended function. The program contains provisions for increased inspection frequency and trending of structures and components in accordance with 10 CFR 50.65(a)(1), if the extent of degradation is such that the structure or component may not meet its design basis or, if allowed to continue uncorrected until the next normally scheduled assessment, may not meet its design basis.

Underground concrete structures and structures in contact with ground water are not subject to an aggressive environment. The program will perform periodic sampling and chemical analysis of ground water for pH, chlorides, and sulfates on a frequency of at least once every 5 years to ensure that the ground water has not become aggressive.

For surfaces provided with protective coatings, observation of the condition of the paint or coating is an effective method for identifying the absence of degradation of the underlying material. Therefore, monitoring of the condition of coatings on SSCs within the scope of the Structures Monitoring Program is implicitly included within the program.

NUREG-1801 Consistency

The Structures Monitoring Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.S6, Structures Monitoring Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise plant procedures to include the following in-scope structures: • Battery house 230kV switchyard • Control house 230kV switchyard • Fire pump house • Fire water storage tank foundations • Fuel oil storage tank foundation • Manholes, handholes and duct banks • Plant stack • Transformer and switchyard support structures and foundations Revise plant procedures to include a list of structural components and commodities within the scope of the program. Revise plant procedures to include periodic sampling and chemical analysis of ground water.
2. Preventive Actions	Revise plant procedures to include the preventive actions for storage of ASTM A325, ASTM F1852, and ASTM A490 bolting from Section 2 of Research Council on Structural Connections publication, "Specification for Structural Joints Using ASTM A325 or A490 Bolts."

Element Affected	Enhancement
3. Parameters Monitored or Inspected	Revise plant procedures to include the following parameters to be monitored or inspected: • For concrete structures, base inspections on quantitative requirements of industry codes, standards and guidelines (e.g., ASCE 11, ACI 349.3R) and consideration of industry and plant-specific operating experience. • For concrete structures and components include loss of material, loss of bond, increase in porosity and permeability, loss of strength, and reduction in concrete anchor capacity due to local concrete degradation. • For chemical analysis of ground water, monitor pH, chlorides and sulfates. Revise plant procedures to include the following components to be monitored for the associated parameters: • Anchor bolts (nuts and bolts) for loss of material and loose or missing nuts and bolts. • Elastomeric vibration isolators and structural sealants for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening).
4. Detection of Aging Effects	Revise plant procedures to include the following: • Visual inspection of elastomeric material should be supplemented by feel or touch to detect hardening if the intended function of the elastomeric material is suspect. Include instructions to augment the visual examination of elastomeric material with physical manipulation of at least 10 percent of available surface area. • Structures will be inspected at least once every 5 years with provisions for more frequent inspections of structures and components categorized as (a)(1) in accordance with 10 CFR 50.65. • Submerged structures will be inspected at least once every 5 years. • Sampling and chemical analysis of ground water at least once every 5 years. The program owner will review the results and evaluate any anomalies and perform trending of the results.

Operating Experience

The following discussion provides objective evidence that the Structures Monitoring Program will be effective in ensuring that intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- WF3 engineering conducted the second inspection of structures within the scope of the maintenance rule, 10 CFR 50.65, in 2002. Inspection methods consisted of visual examination of the accessible areas of the concrete walls, ceilings and floors, and miscellaneous structural steel components along with masonry block walls of the maintenance rule structures. Overall, concrete walls, ceilings and floors, and miscellaneous structural steel components were found in acceptable condition with no impact on structural integrity. Additional findings are noted as follows.

  In the reactor auxiliary building (RAB), shrinkage cracking in the concrete ceilings in various locations was found comparable to that found during the 1997 inspections. Rusting found on some structural steel was also similar to that noted during the 1997 inspections. The minor defects observed have no impact on RAB structural integrity.

  In the fuel handling building (FHB), all elevations were observed to be in excellent condition with no defects.

  Minor surface rusting observed in isolated locations of the containment building was evaluated and found to have no impact the containment building structural integrity.

  Minor cracking of the cooling tower concrete basemats was observed. Some minor rusting of the structural steel and other items was observed. These minor defects have no impact on the east and west cooling towers structural integrity.

  In the turbine building (TB), numerous cracks had been identified and sealed in the past. The crack repairs were holding up well. These minor defects have no impact on TB structural integrity.

  For the transformer and switchyard support structures and foundations, localized surface rust was noted on some galvanized structural members around welded connections and electrical raceway components. Some cracking was noted on concrete curbs. These minor defects noted have no impact on the structural integrity of the transformer and switchyard support structures and foundations.

- WF3 engineering conducted the third inspection of structures within the scope of the maintenance rule, 10 CFR 50.65, in 2009 and 2010. Overall, concrete walls, ceilings and floors, and miscellaneous structural steel components were found in acceptable condition with no impact on structural integrity and no significant changes from conditions found in the previous maintenance rule inspection.

- In 2010, inspections identified deficiencies in the sealant of several cracks and joints on the turbine building roof that were caulked in the past. Some of this caulking was cracked or missing, allowing rainwater to enter the turbine building. However, none of the wetted equipment is safety-related or is required for ensuring accident prevention or mitigation or safe plant shutdown. This condition was corrected.

- In 2012, inspections identified four grout locations on the east concrete wall of the B dry cooling tower with evidence of potential alkali-silica reaction (ASR). ASR is often indicated by grid-like surface cracking in the concrete. The only evidence of ASR is the visual observations. No definitive tests have been conducted on the potentially affected concrete (grout). This condition was only found in the grouted applications and not the reinforced concrete wall. A walkdown inspection of other potential areas around the perimeter of the nuclear plant island structure was conducted, and no additional evidence of ASR was found on the exposed concrete. The as-found condition was determined acceptable.

- Walkdowns performed in 2012 by the steam generator replacement project engineering group identified cracks on the exterior and interior surfaces of the new shield building concrete wall. The cracks are similar to cracks that were identified in the original concrete. The maximum width of cracks measured is 0.016 inches. Most of the cracks have a width of 0.007 inches or less. Crack orientations included vertical, horizontal, and diagonal. Cracks in the new concrete were expected. In general, this kind of concrete cracking is caused by excess stresses due to normal concrete shrinkage and can occur in any direction. The cracks are well within the acceptable width criteria based on the existing cracks discovered in the shield building wall documented in an earlier evaluation. Additionally, the crack widths are much smaller than the maximum acceptance criteria identified in site procedures. This criteria is similar to the criteria provided in ACI 349.3R, "Evaluation of Existing Nuclear Safety-Related Concrete Structures," and NRC Information Notice 2010-14, "Containment Concrete Surface Condition Examination Frequency and Acceptance Criteria." The cracks are acceptable and do not affect the structural qualification of the shield building. Additionally, the cracks do not affect the shield building's ability to perform its design basis functions.

- In 2013, inspections on the +15 level of the turbine building (TB) identified a four-foot long crack in the TB floor in the slab along the wall of the reactor auxiliary building. The crack was slightly raised and pieces of concrete were loose and coming out of the crack. The subject crack was inspected by engineering and determined to be due to settlement. Because all vital equipment in the TB is supported by individual pedestals and not the slab itself, the crack does not impact any equipment in the TB.

- During the 2014 NRC component design basis inspection (CDBI), an inspection was performed on the exterior of the shield building. Multiple locations were identified where steel reinforcement (rebar) was exposed due to concrete spalling. The largest spalled area of concrete is approximately 15 inches x 6 inches. The areas of concrete spalling were identified while inspecting from the +69 RAB roof. The areas of significant concrete spalling were on the concrete pilasters. Site calculations show that the concrete pilasters function only as architectural treatment of the outside face of the shield building.

The identification of degradation and initiation of corrective action prior to loss of intended function demonstrates that the Structures Monitoring Program has been effective. The use of proven program activities provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Structures Monitoring Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.39 THERMAL AGING EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The Thermal Aging Embrittlement of CASS Program is a new program that will manage reduction in fracture toughness and cracking. The program consists of a determination of the susceptibility of CASS piping, piping components, and piping elements to thermal aging embrittlement based on casting method, molybdenum content, and percent ferrite. For potentially susceptible components aging management is accomplished through qualified visual inspections, such as enhanced visual examination, qualified ultrasonic testing methodology, or component-specific flaw tolerance evaluation in accordance with ASME Section XI code, 2001 Edition 2003 addendum. Applicable industry standards and guidance documents are used to delineate the program.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program will be consistent with the program described in NUREG-1801, Section XI.M12, Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS).

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program is a new program. Industry operating experience will be considered in the implementation of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the WF3 10 CFR 50 Appendix B quality assurance program.

This program applies to the potential reduction of fracture toughness due to thermal aging embrittlement. There is no operating experience at WF3 involving this aging effect. As stated in NUREG-1801, Revision 2, Section XI.M12, Element 10, this new program was developed using research data obtained on both laboratory-aged and service-aged materials.

The proposed inspection techniques specified by the program for examination of flaws are proven techniques used to satisfy ASME code inspection requirements. Accordingly, there is reasonable assurance that this new aging management program will be effective through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.40 WATER CHEMISTRY CONTROL – CLOSED TREATED WATER SYSTEMS

Program Description

The Water Chemistry Control – Closed Treated Water Systems Program manages loss of material, cracking, and reduction of heat transfer in components in an environment of treated water through monitoring and control of water chemistry, including the use of corrosion inhibitors, chemical testing, and visual inspections of internal surface condition. The EPRI Closed Cycle Cooling Guideline (1007820), industry and in-house operating experience, and vendor recommendations are used to delineate the program.

NUREG-1801 Consistency

The Water Chemistry Control – Closed Treated Water Systems Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M21A, Closed Treated Water Systems, as modified by LR-ISG-2012-02, Aging Management of Internal Surfaces, Fire Water Systems, Atmospheric Storage Tanks, and Corrosion under Insulation.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to include high pressure fire water diesel pump jacket water system.
3. Parameters Monitored or Inspected	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to specify water chemistry parameters monitored and the acceptable range of values for these parameters that are in accordance with EPRI 1007820, industry guidance, or vendor recommendations.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to inspect accessible components whenever a closed treated water system boundary is opened. Ensure that a representative sample of piping and components is inspected at a frequency of at least every 10 years. These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection guidance by qualified personnel using procedures that are capable of detecting corrosion, fouling, or cracking. If visual examination identifies adverse conditions, additional examinations, including ultrasonic testing, are conducted.
4. Detection of Aging Effects	Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to define a representative sample as 20 percent of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. Components inspected will be those with the highest likelihood of corrosion, fouling, or cracking.
4. Detection of Aging Effects	Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to perform treated water sampling and analysis of the closed treated water systems per industry standards and in no case greater than quarterly unless justified with an additional analysis.
6. Acceptance Criteria	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to specify water chemistry parameters monitored and the acceptable range of values for these parameters that are in accordance with EPRI 1007820, industry guidance, or vendor recommendations.
6. Acceptance Criteria	Revise the Water Chemistry Control – Closed Treated Water Systems Program procedures to provide acceptance criteria for inspections. Ensure system components meet system design requirements, such as minimum wall thickness.

Operating Experience

Important chemistry parameters are routinely measured and trended as part of the water chemistry control for closed treated water systems. The following operating experience provides objective evidence that the Water Chemistry Control – Closed Treated Water Systems Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of extended operation.

- In 2009, a quality assurance assessment found that the areas of chemistry and effluent and environmental monitoring at Waterford 3 were effective. There were no discrepancies noted in the sampling frequencies and analyses reviewed.

- In 2011, a quality assurance assessment team concluded the combined chemistry, effluents and environmental monitoring program is effective. The chemical control program and control of chemistry were found satisfactory.

- In October 2007, it was identified that the stator cooling water alkalizer skid was unable to maintain stator cooling water inlet conductivity within site procedure limits. Procedure steps were confirmed adequate to address the condition. Per procedure, the alkalizer storage tank was drained and flushed to correct the condition.

- In February 2013, a condition was identified where component cooling water chemistry was being affected and at high risk of falling below specification for pH, molybdate, tolytriazole, and biocides due to the abnormally high frequency of draining the system to maintain surge tank level. The source of the system in-leakage was identified as a radiation monitor sample cooler. The cooler was replaced and the condition corrected.

- In August 2013, the component cooling water system quarterly sample result for chloride concentration was trending higher than historical operating range (levels remained within procedure specification limits). Corrective actions completed to address this condition included component cooling water bleed and feed operations and more frequent monitoring until chloride levels returned to stable historical values.

As discussed in element 10 to NUREG-1801, Section XI.M21A, this program considers the technical information and industry operating experience provided in NRC LER 50-327/93-029-00 and LER 50-280/91-019-00.

The identification of out-of-specification chemistry parameters and initiation of corrective action, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the Water Chemistry Control – Closed Treated Water Systems Program will remain effective. The continued application of these proven monitoring methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Water Chemistry Control – Closed Treated Water Systems Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.41 WATER CHEMISTRY CONTROL – PRIMARY AND SECONDARY

Program Description

The Water Chemistry Control – Primary and Secondary Program manages loss of material, cracking, and reduction of heat transfer in components in an environment of treated water through periodic monitoring and control of water chemistry. The Water Chemistry Control – Primary and Secondary Program monitors and controls water chemistry parameters such as pH, chloride, fluoride, and sulfate to keep peak levels of various contaminants below system specific limits. EPRI Report 1014986, Rev. 6, is used to provide guidance for primary water chemistry, and EPRI Report 1016555, Rev. 7, is used to provide guidance for secondary water chemistry.

The One-Time Inspection Program (Section B.1.28) uses inspections or nondestructive evaluations of representative samples to verify that the Water Chemistry Control – Primary and Secondary Program has been effective at managing the effects of aging. The representative sample includes low flow and stagnant areas.

NUREG-1801 Consistency

The Water Chemistry Control – Primary and Secondary Program is consistent with the program described in NUREG-1801, Section XI.M2, Water Chemistry.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The following operating experience provides objective evidence that the Water Chemistry Control – Primary and Secondary Program will be effective in ensuring that component intended functions are maintained consistent with the current licensing basis through the period of continued operation.

- During a secondary chemistry self-assessment in March 2006, it was discovered that a chemistry procedure did not meet all EPRI guidelines for deviation from action levels or controlled chemistry parameters. Procedure changes were made to reflect applicable industry guidance on deviating from chemistry guidelines.
- In April 2008, hydrogen peroxide was added to the reactor coolant system prior to boron equalization and prior to reaching refueling boron concentration in the pressurizer. This impaired the ability to adequately mix the RCS and pressurizer. The procedure was

revised to specify that RCS boration and boron equalization shall be complete prior to adding hydrogen peroxide to the RCS.

- In June 2008, elevated conductivity levels were noted following a refueling outage. The levels were higher than recorded in the previous outage. RCS conductivity is a diagnostic parameter without specification. Other monitored parameters, such as sodium, chloride, sulfate, fluoride, oxygen, ammonia, and lithium, were within specifications and at normal levels for exiting a refueling outage. RCS conductivity returned to typical values within a few days following startup. No other monitored parameters were elevated in an atypical fashion during startup. No other actions were necessary.

As discussed in element 10 to NUREG-1801, Section XI.M2, this program considers the technical information and industry operating experience provided in NRC IN 84-18, IN 96-11, GL 97-01, IN 97-19, IN 80-38, IN 94-63, IN 91-05, IN 97-19, IN 89-33, IN 94-87, IN 97-88, IN 90-10, IN 96-11, NRC Bulletin 89-01 and its two supplements, IN 2006-27, GL 95-05, IN 82-37, IN 85-65, IN 90-04, and IN 2007-37.

The identification of degradation and initiation of corrective action prior to loss of intended function, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the Water Chemistry Control – Primary and Secondary Program will remain effective. The application of these proven methods provides reasonable assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for aging management programs is discussed in Section B.0.4.

Conclusion

The Water Chemistry Control – Primary and Secondary Program provides reasonable assurance that the effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.2 REFERENCES

B.2-1 *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants.* NUREG-1800*.* U.S. NRC. Revision 2. December 2010.

B.2-2 *Generic Aging Lessons Learned (GALL) Report.* NUREG-1801. U.S. NRC. Revision 2. December 2010.

Appendix C

Response to Selected Applicant/Licensee Action Items for Inspection and Evaluation Guidelines for PWR Internals

Waterford Steam Electric Station, Unit 3

The Electric Power Research Institute (EPRI) has published the NRC-approved version of Materials Reliability Program (MRP) Report 1022863 (MRP-227-A), "Pressurized Water Reactor (PWR) Internals Inspection and Evaluation Guidelines." This report was developed to provide inspection and evaluation guidelines as part of an aging management program for PWR reactor vessel internal components.

Entergy submitted the WF3 reactor vessel internals (RVI) inspection plan and response to applicant/licensee action items (A/LAI) 1, 3, 4, 6, and 7 on December 16, 2013 (Agencywide Documents Access and Management System [ADAMS] Accession No. ML13352A041). The NRC acceptance of the RVI inspection plan and responses to A/LAIs 1, 3, 4, 6 and 7 is documented in a letter dated October 6, 2015, “Waterford Steam Electric Station, Unit 3 – Safety Evaluation Regarding the Aging Management Program for Reactor Vessel Internals (TAC No. MF3247)” (ADAMS Accession No. ML15267A797).

The responses to remaining A/LAIs 2, 5, and 8 from the MRP-227-A safety evaluation (SE) are provided below.

Section 4.2.2, A/LAI 2

> Consistent with the requirements addressed in 10 CFR 54.4, each applicant/licensee is responsible for identifying which RVI components are within the scope of [license renewal] LR for its facility. Applicants/licensees shall review the information in Tables 4-1 and 4-2 in MRP-189, Revision 1, and Tables 4-4 and 4-5 in MRP-191 and identify whether these tables contain all of the RVI components that are within the scope of LR for their facilities in accordance with 10 CFR 54.4. If the tables do not identify all the RVI components that are within the scope of LR for its facility, the applicant or licensee shall identify the missing component(s) and propose any necessary modifications to the program defined in MRP-227, as modified by this SE, when submitting its plant-specific [aging management program] AMP. The AMP shall provide assurance that the effects of aging on the missing component(s) will be managed for the period of extended operation.

Response to A/LAI 2

MRP-189 and MRP-191, Table 4-4 are not applicable to WF3.

Entergy reviewed the information in Table 4-5 of MRP-191 and determined that the following additional WF3 components are within the scope of license renewal. However, based on the expert panel review, no modifications to the WF3 program based on MRP-227-A are necessary. The expert panel consisted of Westinghouse, industry, and station personnel.

Summary of Evaluated Waterford 3 Components Not Included in MRP-191	
Component	**Evaluation Results**
Flow bypass inserts	Classified as No Additional Measures.
Flow restrictor plugs	Do not require additional aging management beyond that included in MRP-227-A.
Core stabilizing shims	
Core stabilizing dowel pins	
Incore instrumentation (ICI) couplings	
Core stabilizing bolts	Covered under the WF3 ASME Section XI In-Service Inspection Program (Section B.1.15).

The flow bypass inserts are subcomponents of the control element assembly (CEA) shroud assemblies, which were classified as “No Additional Measures” components. Therefore, no further action is required for managing the effects of aging on the flow bypass inserts. An expert panel evaluated the remaining 5 components in accordance with the expert panel guidance applied in MRP-191 (Section 6). Based on environment, material, operating experience and current RVI inspections, the expert panel determined that the flow restrictor plugs, core stabilizing shims and dowels, and ICI coupling did not require additional inspections beyond those specified in MRP-227-A. Based on operating experience, the expert panel determined that the core stabilizing bolts required inspection. However, the core stabilizing lug assembly, including the bolts, is examined as part of the Waterford 3 ASME Section XI In-Service Inspection Program. Thus, the core stabilizing bolts will be added to the Waterford 3 RVI aging management program as an Existing Inspection Component.

Several components have different materials than those documented in MRP-191, but the differences either result in no additional aging effects requiring management, or the aging effects are already managed by an alternate Waterford 3 program, such as the ASME Section XI In-Service Inspection Program. Therefore, no modifications to the program provisions in MRP-227-A are necessary. The components fabricated from different materials evaluated in MRP-191 are tabulated below. The expert panel evaluation provides reasonable assurance that the effects of aging on the Waterford 3 RVI components within the scope of license renewal, but not explicitly identified in the generic CE-designed PWR RVI components from MRP-191, will be adequately managed for the period of extended operation.

Summary of Waterford 3 and MRP-191 Component Material Differences			
Assembly	**Component**	**MRP-191 Material**	**WF3 Material**
CEA – shroud assembly	CEA shroud extension shaft guide cylinder	304 SS*	304L SS
	Instrument tube: instrument guide block	304 SS	UNS S21800 (Nitronic 60)
	CEA shroud bolt lock bars	A286 SS	304 SS
Core shroud assembly	Guide lug insert bolt dowel pin	A286 SS	304 SS
ICI	ICI guide tubes	316 SS	304 SS

*Stainless steel

The generic scoping and screening of the RVI, as summarized in MRP-191 and MRP-232, to support the inspection sampling approach for aging management of the RVI specified in MRP-227-A are applicable to Waterford 3 with the addition of an Existing Inspection requirement for the core stabilizing bolts.

In summary, six components not explicitly addressed in MRP-191 were evaluated for inclusion in the WF3 aging management program. One of these, the core stabilizing bolts, will be added to the RVI aging management program as an Existing Inspection component. With this addition, WF3 satisfies A/LAI 2 of the NRC SE on MRP-227, Revision 0. Therefore, WF3 meets the conditions for application of MRP-227-A as a strategy for managing the effects of aging in reactor vessel internals components.

<u>Section 4.2.5, A/LAI 5</u>

> As addressed in Section 3.3.5 in this SE, applicants/licensees shall identify plant-specific acceptance criteria to be applied when performing the physical measurements required by the NRC-approved version of MRP-227 for loss of compressibility for Westinghouse hold down springs, and for distortion in the gap between the top and bottom core shroud segments in CE units with core barrel shrouds assembled in two vertical sections. The applicant/licensee shall include its proposed acceptance criteria and an explanation of how the proposed acceptance criteria are consistent with the plants' licensing basis and the need to maintain the functionality of the component being inspected under all licensing basis conditions of operation during the period of extended operation as part of their submittal to apply the approved version of MRP-227.

Response to A/LAI 5

The maximum value for the gap between the interfacing plates of the core shroud upper and lower subassemblies is 0.442 inches. This maximum gap, which occurs at the innermost corners of these interfacing plates, reflects both differential thermal expansion (from gamma heating) and irradiation-induced void swelling, and also includes the permissible as-fabricated gap. The structural and functional effects associated with the presence of this gap have been evaluated and are acceptable.

The portion of this total gap due to differential thermal expansion would only be present during power operation. The portion of the total gap due to irradiation-induced void swelling would be present under all conditions, including plant shutdown, during which physical examinations of the core shroud (CS) will be performed.

During plant shutdown, the maximum value for the gap between the interfacing plates of the CS upper and lower subassemblies, reflecting irradiation-induced void swelling, is 0.125 inches (1/8 inch). The maximum gap would occur at the innermost corners.

Based on these results, a maximum, bounding gap between the interfacing plates of the CS upper and lower subassemblies, as could be present during plant shutdown, is set at 1/8 inch. This gap may be used as an acceptance criterion for the physical examination of gaps in the Waterford 3 CS. This acceptance criterion is greater than the minimum value of 0.022 inches. For reference, the maximum permissible as-fabricated local gap between the top and bottom sections of the CS and between the CS segments is 0.015 inches.

Section 4.2.8, A/LAI 8

> Applicants/licensees shall make a submittal for NRC review and approval to credit their implementation of MRP-227, as amended by this SE, as an AMP for the RVI components at their facility. This submittal shall include the information identified in Section 3.5.1 of the SE, which states, "In addition to the implementation of MRP-227 in accordance with NEI 03-08, applicants/licensees whose licensing basis contains a commitment to submit a PWR RVI AMP and/or inspection program shall also make a submittal for NRC review and approval to credit their implementation of MRP-227, as amended by this SE. An applicant's/licensee's application to implement MRP-227, as amended by this SE shall include the following items (1) and (2). Applicants who submit applications for license renewal after the issuance of this SE shall, in accordance with the NUREG-1801, Revision 2, submit the information provided in the following items (1) through (5) for staff review and approval."

1. An AMP for the facility that addresses the 10 program elements as defined in NUREG-1801, Revision 2, AMP XI.M16A.

Response: The AMP that addresses the 10 program elements as defined in NUREG-1801, Revision 2, Section XI.M16A, is described in Section B.1.33, Reactor Vessel Internals.

2. To ensure the MRP-227 program and the plant-specific action items will be carried out by applicants/licensees, applicants/licensees are to submit an inspection plan which addresses the identified plant-specific action items for staff review and approval consistent with the licensing basis for the plant. If an applicant/licensee plans to implement an AMP which deviates from the guidance provided in MRP-227, as approved by the NRC, the applicant/licensee shall identify where their program deviates from the recommendations of MRP-227, as approved by the NRC, and shall provide a justification for any deviation which includes a consideration of how the deviation affects both "Primary" and "Expansion" inspection category components.

Response: The AMP to implement MRP-227-A with no deviations or plant-specific action items is described in Section B.1.33, Reactor Vessel Internals. The RVI Inspection Plan was submitted for staff review on December 16, 2013 (ADAMS Accession No. ML13352A041).

3. The regulation at 10 CFR 54.21(d) requires that an FSAR 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 LR referencing MRP-227, as approved by the staff, for their RVI component AMP shall ensure that the programs and activities specified as necessary in MRP-227, as approved by the NRC, are summarily described in the FSAR supplement.

Response: The FSAR Supplement is included in Appendix A of the LRA and includes a summary of the programs and activities specified as necessary for the Reactor Vessel Internals Program (Section A.1.33).

4. The regulation at 10 CFR 54.22 requires each applicant for LR to submit any TS changes (and the justification for the changes) that are necessary to manage the effects of aging during the period of extended operation as part of its LR application (LRA). For the plant [current licensing bases] CLBs that include mandated inspection or analysis requirements for RV internals either in the operating license for the facility or in the facility [Technical Specifications] TS, the applicant/licensee shall compare the mandated requirements with the recommendations in the NRC-approved version of MRP-227. If the mandated requirements differ from the recommended criteria in MRP-227, as approved by the NRC, the conditions in the applicable license

conditions or TS requirements take precedence over the MRP recommendations and shall be complied with.

Response: No technical specification changes are necessary for WF3 based upon MRP-227-A and its SE.

5. Pursuant to 10 CFR 54.21(c)(1), the applicant is required to identify all analyses in the CLB for their RVI components that conform to the definition of a TLAA in 10 CFR 54.3 and shall identify these analyses as TLAAs for the application in accordance with the TLAA identification requirement in 10 CFR 54.21(c)(1). MRP-227 does not specifically address the resolution of TLAAs that may apply to applicant/licensee RVI components. Hence, applicants/ licensees who implement MRP- 227, as approved by the NRC, shall still evaluate the CLB for their facilities to determine if they have plant-specific TLAAs that shall be addressed. If so, the applicant's/licensee's TLAA shall be submitted for NRC review along with the applicant's/licensee's application to implement the NRC-approved version of MRP-227.

   For those cumulative usage factor (CUF) analyses that are TLAAs, the applicant may use the PWR Vessel Internals Program as the basis for accepting these CUF analyses in accordance with 10 CFR 54.21(c)(1)(iii) only if the RVI components in the CUF analyses are periodically inspected for fatigue-induced cracking in the components during the period of extended operation. The periodicity of the inspections of these components shall be justified to be adequate to resolve the TLAA. Otherwise, acceptance of these TLAAs shall be done in accordance with either 10 CFR 54.21(c)(1)(i) or (ii), or in accordance with 10 CFR 54.21(c)(1)(iii) using the applicant's program that corresponds to NUREG-1801, Revision 2, AMP X.M1, "Metal Fatigue of Reactor Coolant Pressure Boundary Program". To satisfy the evaluation requirements of ASME Code, Section III, Subsection NG-2160 and NG-3121, the existing fatigue CUF analyses should include the effects of the reactor coolant system water environment.

Response: TLAA evaluations are documented in LRA Section 4.3, Metal Fatigue.

Appendix D

Waterford Steam Electric Station, Unit 3
License Renewal Application

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 WF3 Technical Specifications determined that no changes to the Technical Specifications are required.