LICENSE RENEWAL APPLICATION

Sequoyah Nuclear Plant
Units 1 and 2

Facility Operating License Nos.
DPR-77 and DPR-79

PREFACE

The following describes the information location, layout, and editorial conventions in the Sequoyah Nuclear Plant (SQN) 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," are referred to by the document number, i.e., NUREG-1801 and 10 CFR 54, respectively. References to the UFSAR are to the SQN Updated Final Safety Analysis Report, Revision 23.

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 2.2-4. Tables 2.2-1-A, 2.2-1-B and 2.2-3 list mechanical systems, electrical and instrumentation and controls (I&C) systems, and structures, respectively, within the scope of license renewal. Tables 2.2-2 and 2.2-4 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) 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 for Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, U.S. Nuclear Regulatory Commission, December 2010. The tables include comparisons with the evaluations documented in NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 2, U.S. Nuclear Regulatory Commission, December 2010.

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 §54.3 will remain in effect.

Appendix A, Updated 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 licenses, the material contained in this appendix will be incorporated into the UFSAR. The information in Appendix A fulfills the requirements in 10 CFR 54.21(d).

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 Applicant Action Items for Inspection and Evaluation Guidelines for PWR Internals (MRP-227-A), provides the SQN response to applicant action items identified in the Nuclear Regulatory Commission (NRC) safety evaluation (SE) of MRP-227.

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 which fulfills the requirements of 10 CFR 54.23 and 10 CFR 51.53(c).

Abbreviations and Acronyms

Abbreviation or Acronym	**Meaning**
AAC	all aluminum conductor
ABGTS	auxiliary building gas treatment system
ABSCE	auxiliary building secondary containment enclosure; auxiliary building secondary containment envelope
AC	alternating current
ACA	auxiliary control air
ACAR	aluminum conductor aluminum reinforced
ACI	American Concrete Institute
ACSR	aluminum conductor steel reinforced
ADGB	additional diesel generator building
AEM	aging effect/mechanism
AERCW	auxiliary essential raw cooling water
AFW	auxiliary feedwater
AHU	air handling unit
Al	aluminum
AMP	aging management program
AMR	aging management review
AMSAC	ATWS mitigation system actuation circuitry
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATSG	advanced tube support grid
ATWS	anticipated transient without scram
AUO	assistant unit operator
B&W	Babcock & Wilcox
BMI	bottom-mounted instrumentation
BTP	Branch Technical Position

Abbreviation or Acronym	Meaning
BWR	boiling water reactor
CAP	Corrective Action Program
CASS	cast austenitic stainless steel
CCS	component cooling system
CCW	condenser cooling water; condenser circulating water (synonymous terms)
CE	conducts electricity; Combustion Engineering
CETNA	core exit thermocouple nozzle assemblies
CF	chemistry factor
CFR	Code of Federal Regulations
CII	containment inservice inspection
circ.	circumferential
CLB	current licensing basis
CMAA	Crane Manufacturer's Association of America
CO_2	carbon dioxide
CRD	control rod drive
CRDM	control rod drive mechanism
CRGT	control rod guide tube
CS	containment spray
CSST	common station service transformers
CST	condensate storage tank
Cu	copper
CUF	cumulative usage factor
CVCS	chemical volume and control system
DC	direct current
DCD	design criteria document
DF	direct flow
DG	diesel generator

Abbreviation or Acronym	**Meaning**
E	Expansion (RVI inspection group)
EAF	environmentally assisted fatigue
EBR	electrical board room
ECCS	emergency core cooling system
EFPY	effective full power years
EGTS	emergency gas treatment system
El.	elevation
EN	shelter or protection
EPRI	Electric Power Research Institute
EQ	environmental qualification
EQIR	equipment qualification information release
ERCW	essential raw cooling water
ERFBS	electrical raceway fire barrier systems
ESF	engineered safety feature
ET	electromagnetic testing (eddy current)
EVT	Enhanced visual testing (a visual NDE method that includes EVT-1)
ext	external
FAC	flow-accelerated corrosion
FB	fire barrier
F_{en}	fatigue correction factor(s)
FERC	Federal Energy Regulatory Commission
FLB	flood barrier
FPR	Fire Protection Report
FSAR	Final Safety Analysis Report
ft-lb	foot-pound
FW	feedwater
GL	Generic Letter

Abbreviation or Acronym	Meaning
GSI	Generic Safety Issue
HDPE	high density polyethylene
HELB	high-energy line break
HEPA	high-efficiency particulate air
HPFP	high pressure fire protection
hr	hour
HS	heat sink
HVAC	heating, ventilation, and air conditioning
I&C	instrumentation and control
IASCC	irradiation-assisted stress corrosion cracking
ID	identification
IE	irradiation embrittlement; [NRC Office of] Inspection and Enforcement
IGA	intergranular attack
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
ISR	irradiation-enhanced stress relaxation
ksi	kilo-pounds per square inch
kV	kilo-volt
LAS	low alloy steel

Abbreviation or Acronym	Meaning
LBB	leak before break
LER	Licensee Event Report
LLRT	local leakage rate test
LOCA	loss of coolant accident
LR	license renewal
LRA	license renewal application
LRT	leakage rate test
LTOP	low temperature overpressure protection
MB	missile barrier
MCM	thousand circular mils
MCR	main control room
MEB	metal-enclosed bus
MeV	million electron volt
MFPT	main feedwater pump turbine
MIC	microbiologically influenced corrosion
MRP	Materials Reliability Program
MS	main steam
MSIV	main steam isolation valve
MWe	megawatts-electrical
MWt	megawatts-thermal
N	No additional measure (RVI inspection group)
NA	not applicable; neutron absorption
n/cm^2	neutrons per square centimeter
NDE	nondestructive examination
NEI	Nuclear Energy Institute
NFPA	National Fire Protection Association
NPS	nominal pipe size

Abbreviation or Acronym	Meaning
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
OE	operating experience
OVHLL	overhead heavy load and light load
P	Primary (RVI inspection group)
PB	pressure boundary
PDM	predictive maintenance
PER	problem evaluation report
pH	potential of hydrogen
PH SS	precipitation-hardened stainless steel
PM	preventive maintenance
PORV	power-operated relief valve
ppb	parts per billion
ppm	parts per million
PR	pressure relief
PSPM	periodic surveillance and preventive maintenance
P-T	pressure-temperature
PTLR	pressure-temperature limits report
PTS	pressurized thermal shock
PVC	polyvinyl chloride
PWR	pressurized water reactor
PWSCC	primary water stress corrosion cracking
QA	quality assurance
RBPV	reactor building purge ventilating
RCP	reactor coolant pump

Abbreviation or Acronym	**Meaning**
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RG	Regulatory Guide
RHR	residual heat removal
RSG	replacement steam generator
RTD	resistance temperature detector
RT_{NDT}	reference temperature (nil-ductility transition)
RT_{PTS}	reference temperature (pressurized thermal shock)
RVI	reactor vessel internals
RWST	refueling water storage tank
SAMA	severe accident mitigation alternatives
S&PC	steam and power conversion
SBO	station blackout
SCBA	self-contained breathing apparatus
SCC	stress corrosion cracking
SCSA	station control and service air
SCV	steel containment vessel
SE	safety evaluation
SFP	spent fuel pit (or pool)
SFPC	spent fuel pit (or pool) cooling
SI	safety injection; surveillance instruction
SNS	support for Criterion (a)(2) equipment
SQN	Sequoyah Nuclear Plant
SRE	support for Criterion (a)(3) equipment
SRP	[NUREG-1800, License Renewal] Standard Review Plan
SS	stainless steel
SSC	system, structure, or component
SSR	support for Criterion (a)(1) equipment

Abbreviation or Acronym	**Meaning**
TDAFW	turbine-driven auxiliary feedwater
TE	thermal embrittlement
TFPI	triennial fire protection inspection
TLAA	time-limited aging analysis
TS	Technical Specifications
TVA	Tennessee Valley Authority
UFSAR	Updated Final Safety Analysis Report
USAS	United States of America Standard
USE	upper-shelf energy
USI	unresolved safety issue
UT	ultrasonic testing (a volumetric NDE method)
V	volt
VCT	volume control tank
VT	visual testing (a visual NDE method that includes VT-1 and VT-3)
WCAP	Westinghouse Commercial Atomic Power
X	Existing (RVI inspection group)
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 54), this application seeks renewal for an additional 20-year term of the facility operating licenses for Tennessee Valley Authority (TVA) Sequoyah Nuclear Plant (SQN) Units 1 and 2. The facility operating license for Unit 1 (Docket Number 50-327, License Number DPR-77) expires at midnight on September 17, 2020, and Unit 2's license (Docket Number 50-328, License Number DPR-79) expires at midnight on September 15, 2021. The application also applies to renewal of those NRC source materials, special nuclear material, and by-product material licenses that are subsumed or combined with the facility operating licenses.

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 renewed facility operating licenses for SQN Units 1 and 2.

1.1 GENERAL INFORMATION

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

1.1.1 Name of Applicant

Tennessee Valley Authority

1.1.2 Address of Applicant

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

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

Gary Adkins
Manager, Sequoyah License Renewal Project
1101 Market Street
Chattanooga, TN 37401-2801

Tennessee Valley Authority
e-mail: gmadkins@tva.gov

Address of Nuclear Facility

Sequoyah Nuclear Plant
2000 Sequoyah Access Road
Soddy-Daisy, TN 37379

1.1.3 Description of Business of Applicants

TVA, the nation's largest public power producer, was established by Congress in 1933 primarily to provide navigation, flood control, agricultural and industrial development and to promote the use of electric power in the Tennessee Valley region. TVA, being an agency of the United States government, is not owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government. Through 158 distributors, TVA supplies electricity to approximately 8.3 million people in the TVA service area.

1.1.4 Legal Status and Organization

TVA is a corporation owned by the U.S. Government. TVA's headquarters are located in Knoxville, Tennessee, with large administrative offices in Chattanooga and Nashville, Tennessee, and Muscle Shoals, Alabama. TVA is governed by a nine-member Board of Directors which sets policy and strategy. The members are nominated by the President of the United States and confirmed by the United States Senate to serve five-year terms. The TVA Board of Directors appoints the TVA President and Chief Executive Officer.

There are currently three vacancies and six sitting Board members. All are U.S. citizens. The names and addresses of the current members of the Board of Directors are as follows:

William B. Sansom Chairman	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Marilyn A. Brown Director	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
William H. Graves Director	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Barbara S. Haskew Director	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Richard C. Howorth Director	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Neil G. McBride Director	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902

The names and addresses of the principal officers of TVA are as follows. The principal officers are all U.S. citizens.

William D. Johnson President & Chief Executive Officer	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Preston D. Swafford Executive Vice President & Chief Nuclear Officer Nuclear Power	Tennessee Valley Authority 1101 Market Street Chattanooga, TN 37402
Kimberly S. Greene Executive Vice President & Chief Generation Officer Generation	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902

Robin Edwin Manning Executive Vice President & Chief Energy Delivery Officer Energy Delivery	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Janet C. Herrin Executive Vice President & Chief Administrative Officer Administrative Services	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
John M. Thomas III Executive Vice President & Chief Financial Officer Financial Services	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Ralph E. Rodgers Executive Vice President & General Counsel	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Michael D. Skaggs Senior Vice President Nuclear Construction	Tennessee Valley Authority 1101 Market Street Chattanooga, TN 37402
Joseph J. Hoagland Senior Vice President Policy and Oversight	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902
Justin C. Maierhofer Vice President & Chief of Staff	Tennessee Valley Authority 400 West Summit Hill Drive Knoxville, TN 37902

1.1.5 Class and Period of License Sought

The applicant requests renewal of the facility operating licenses for SQN Unit 1 (facility operating license Docket Number 50-327, License Number DPR-77) and SQN Unit 2 (facility operating license Docket Number 50-328, License Number DPR-79) for a period of 20 years. The licenses were issued under Section 104(b) of the Atomic Energy Act of 1954 as amended. License renewal would extend the SQN Unit 1 facility operating license from midnight, September 17, 2020, to midnight, September 17, 2040, and the SQN Unit 2 facility operating license from midnight, September 15, 2021, to midnight September 15, 2041. The facilities will be used to generate electricity for distribution to the TVA service area. This application also applies to renewal of those NRC source materials, special nuclear material, and by-product material licenses that are subsumed or combined with the facility operating licenses.

1.1.6 Alteration Schedule

TVA does not propose to alter the station in connection with this application. The evaluation of systems, structures and components as required by 10 CFR 54.21 has been completed and is described in the body of the SQN License Renewal Application. This evaluation did not identify the need for refurbishment of structures or components related to renewal of the SQN Unit 1 or SQN Unit 2 operating licenses.

1.1.7 Regulatory Agencies with Jurisdiction

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

1.1.8 Local News Publications

Chattanooga Times Free Press
400 East 11th Street
Chattanooga, TN 37403

Knoxville News Sentinel
2332 News Sentinel Drive
Knoxville, TN 37921

The Tennessean
1100 Broadway
Nashville, TN 37203

Times Daily
219 W Tennessee Street
Florence, AL 35630

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

1.1.10 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 licenses for SQN 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 Sequoyah Nuclear Power Plant site is a two-unit nuclear power plant located near the geographical center of Hamilton County, Tennessee, on a peninsula on the western shore of the Chickamauga Reservoir at Tennessee River Mile (TRM) 484.5. The site is approximately 18 miles northeast of the city center of Chattanooga, Tennessee.

The plant is located on property owned by the United States and in the custody of TVA. The site comprises approximately 630 acres that includes approximately 525 acres of land known as the industrial site and approximately 105 acres known as the training area peninsula. From U.S. Route 27, the plant is directly accessible from Sequoyah Access Road. Hixson Pike intersects Sequoyah Access road just a few yards west of the site and runs south about 14 miles to Tennessee Highway 153.

Each of the two units employs a pressurized water reactor nuclear steam supply system (NSSS) with four coolant loops furnished by Westinghouse Electric Corporation. Each of the two reactor cores is rated at 3455 MWt and, at this core power, each NSSS will operate at 3467 MWt. The additional 12 MWt is due to the contribution of heat of the primary coolant system from nonreactor sources, primarily reactor coolant pump heat. Each of the reactor cores has an engineered safeguards design rating of approximately 3565 MWt and each NSSS 3577 MWt. The total generator output for each unit is 1199 MWe for the rated core power.

The containment for each of the reactors consists of a freestanding steel vessel with an ice condenser and separate reinforced concrete shield building. The ice condenser was designed by the Westinghouse Electric Corporation. The freestanding containment vessel was designed by Chicago Bridge & Iron (CBI).

Descriptions provided in this LRA are applicable to Sequoyah Nuclear Plant Units 1 and 2. When no relevant difference exists between the two units, the information is presented with no reference to a particular unit and is applicable to both. When a relevant difference exists, unit specific information is provided and is annotated as such (i.e., Unit 1 or Unit 2).

The principal structures at the site consist of two reactor buildings, a turbine building, an auxiliary building, a control building, a service and office building, a diesel generator building, an intake pumping station, essential raw cooling water (ERCW) pumping station, two natural draft cooling towers, 161-kilovolt (kV) and 500-kV switchyards, and an independent spent fuel storage installation (ISFSI). UFSAR Figure 2.1.2-1 shows the arrangement of these structures.

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 SQN 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 aging management review. 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.
DF	Direct flow	Provide spray shield or curbs for directing flow (e.g., safety injection flow to containment sump)
EN	Shelter or protection	Provide shelter or protection to personnel and safety-related equipment (including high-energy line break (HELB), radiation shielding and pipe whip restraint).
FB	Fire barrier	Provide rated fire barrier to confine or retard a fire from spreading to or from adjacent areas of the plant.
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 protective barrier for internal or external flood 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 missile (internal or external) barrier.
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).
PR	Pressure relief	Provide over-pressure protection.
SNS	Support for Criterion (a)(2) equipment	Provide structural or functional support to nonsafety-related equipment whose failure could impact safety-related equipment (10 CFR 54.4(a)(2)).

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

Abbreviation	Intended Function	Definition
SRE	Support for Criterion (a)(3) equipment	Provide structural or functional support to equipment required to meet the Commission's regulations for 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 steam generator 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 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. 2.1-6), provides industry guidance for determining what SSCs are in the scope of license renewal. The process used to determine the systems and structures in the scope of license renewal for SQN 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 SQN equipment database was used to develop a list of plant systems. The equipment database is a controlled list of plant systems and components. Components in the database have unique identifiers that include the system code assigned to the component.

For mechanical system scoping, a system is defined as the collection of mechanical components in the equipment database assigned to the system code. System functions are determined based on the functions performed by those components. Defining a system by the components in the database is consistent with the evaluations performed for maintenance rule scoping by the site.

Structural components included in system codes with mechanical equipment, such as snubbers, and structural commodities associated with mechanical systems, such as pipe hangers and insulation, are evaluated as structural components and bulk commodities.

For the purposes of system level scoping, plant electrical and I&C systems are included in the scope of license renewal by default. Electrical and I&C components in mechanical systems are included in the evaluation of electrical and I&C components, regardless of whether the mechanical system is included in scope. Intended functions for electrical and I&C systems are not identified since the bounding (i.e., included by default) scoping approach 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 in NUREG-1800, Section 2.5.2.1.1. For further discussion of SQN scoping for SBO, see Section 2.1.1.3.5. See Section 2.5 for additional information on electrical scoping.

As the starting point for structural scoping, a list of plant structures was developed from a review of the UFSAR, general site plan UFSAR Figure 2.1.2-1, plant layout drawing, fire hazards analysis, design criteria documents (DCDs), and maintenance rule basis document. 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).

Intended functions for structures and mechanical systems were identified based on reviews of applicable plant licensing and design documentation. Documents reviewed included the UFSAR, maintenance rule basis document, DCDs, the fire hazards analysis, the Appendix R safe shutdown analyses, Technical Specifications, piping flow diagrams, and structural layout drawings.

Each structure and mechanical system was evaluated against the criteria of 10 CFR 54.4 as described in the following sections. Section 2.1.1.1 discusses the evaluation against the safety-related criterion in 10 CFR 54.4(a)(1). Section 2.1.1.2 discusses the evaluation of nonsafety-related SSCs against the criterion of 10 CFR 54.4(a)(2). Section 2.1.1.3 discusses the evaluation against the regulated events criterion, 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 50.49(b)(1)(ii). 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).

A TVA procedure provides the criteria and methodology for determining and evaluating the safety and quality classification of systems, structures and components. The procedure defines safety-related, or quality assurance Category SR, as:

> Those structures, systems, and components which are important to safety because they perform a function necessary to ensure either:
>
> - The integrity of the reactor coolant pressure boundary.
> - The capability to shutdown the reactor and maintain it in a safe condition.
> - The capability to prevent or mitigate the consequences of an incident which could result in potential offsite exposures comparable to those specified in 10 CFR Part 100.

The procedural definition does not specify any set of conditions during which SSCs must be capable of performing their safety functions. The definition is not limited to design basis accidents or any other set of design basis events. Consequently, the definition applies during all licensing basis conditions, encompassing the design basis events as described by 10 CFR 50.49(b)(1). The definition applies to design basis accidents described in Chapter 15 of the SQN UFSAR and to events described in other parts of the licensing basis documentation, such as floods, tornados, seismic events, and high energy line breaks.

The three functional criteria of the definition are essentially the same as the definition used for safety-related SSC in 10 CFR 54.4(a)(1), with two relevant differences. The SQN definition does not refer to the exposure guidelines referred to in Sections 50.34(a)(1) or to the guidelines of Section 50.67(b)(2). Section 50.34(a)(1) reads,

> Stationary power reactor applicants for a construction permit who apply on or after January 10, 1997, shall comply with paragraph (a)(1)(ii) of this section. All other applicants for a construction permit shall comply with paragraph (a)(1)(i) of this section.

Section 50.34(a)(1)(ii) is not applicable since the SQN construction permit was issued before January 10, 1997. Section 50.34(a)(1)(i) refers to Part 100 and therefore imposes no additional requirements.

The exposure guidelines of 10 CFR 50.67(b)(2) address the alternate source term which SQN has credited in the fuel handling accident analysis. A review was performed of the systems and components that are credited for this limited use of 10 CFR 50.67 to ensure the applicable systems and components were included in the scope of the license renewal. No new SSC functional requirements, beyond those established to meet the guidelines of 10 CFR 100, were credited for the application of the alternate source term, so no additional SSC were included in the scope of license renewal.

Since the two differences in the functional criteria definitions do not affect the requirements or create new SSC functional requirements, the SQN definition of safety-related is consistent with the definition of safety-related SSC in 10 CFR 54.4(a)(1). Those SSC with intended safety functions for license renewal are therefore classified as safety-related (quality assurance Category SR).

Mechanical systems that rely on mechanical components to perform a safety function are included in the scope of license renewal. Mechanical system safety functions were obtained from the UFSAR, the maintenance rule basis document, and from 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.

For scoping, structural safety functions are those functions meeting the criterion of 10 CFR 54.4(a)(1) that are performed by a building. Structural safety functions include providing containment or isolation to mitigate post-accident off-site doses and providing support or protection to safety-related equipment. Structural safety functions were identified by reviewing UFSAR, the maintenance rule basis document for buildings and structures, and the fire hazards analysis. Structures that perform a safety function are within the scope of license renewal on the basis of criterion 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.

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 method used was consistent with the preventive option described in Appendix F of NEI 95-10 (Ref. 2.1-6). 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 SQN, 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. For the exceptions where nonsafety-related equipment is required to remain functional to support a safety function (e.g., systems with components that support safe plant operation during a natural flood above plant grade), 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.

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. 2.1-6), 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 connected piping and supports up to and including the first seismic or equivalent anchor beyond the safety-nonsafety interface, or up to a point determined by alternative bounding criteria (such as a base-mounted component or buried piping). 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) spray or leakage.

(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.

Overhead handling systems 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).

Many structural components serve as mitigating features for potential spatial interactions. Mitigating features include missile barriers, flood barriers (such as walls, curbs, dikes, and doors), 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. The structure intended function “Provide shelter and protection for safety-related equipment” can encompass such structural component intended functions as missile barriers and flood barriers. Structures containing these components are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2).

(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 UFSAR 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) Spray or Leakage

Moderate- and low-energy systems have the potential for spatial interactions of spray and leakage. Nonsafety-related systems and nonsafety-related portions of safety-related systems with the potential for spray or leakage 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.

Components that do not contain liquids or steam cannot adversely affect safety-related SSCs due to leakage or spray. 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. 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.

Abandoned equipment 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 the abandoned equipment was determined from discussions with site personnel and by reviewing documents, including piping and instrumentation diagrams, design change notices, and system and structure scoping results.

Structures that are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(1) because they provide support and protection to safety-related equipment are considered to meet the criterion of 10 CFR 54.4(a)(2) also.

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)

Systems and structures in the scope of license renewal for fire protection include those required for compliance with 10 CFR 50.48. 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, SQN fire protection documents were reviewed.

UFSAR Section 9.5.1 references the Fire Protection Report (FPR) for the description of the fire protection system and fire protection program. The fire protection program has been developed to satisfy the requirements of 10 CFR 50 and Branch Technical Position (BTP) APCSB 9.5-1, Appendix A, and to meet the intent of 10 CFR 50 Appendix R. Key sections of the FPR, detailing compliance with the subject requirements and forming the basis of the fire protection program, include the following:

- Part II, Fire Protection Plan
- Part III, Safe Shutdown Capabilities
- Part IV, Alternate Shutdown Capability
- Part V, Emergency Lighting and Reactor Coolant Pump Oil Collection
- Part X, Fire Hazards Analysis

Collectively, these documents identify those systems and structures required for compliance with 10 CFR 50.48.

Part II of the FPR, Fire Protection Plan, describes the organizations supporting the SQN fire protection program, the plant fire protection systems and features, fire loss prevention procedures and administrative controls, the plant emergency response organization, and the operating and surveillance requirements for fire protection systems and features.

Part III of the FPR, Safe Shutdown Capabilities, identifies the analysis methodology used to demonstrate compliance with Sections III.G and III.L of 10 CFR 50 Appendix R. It describes the specific fire safe shutdown functions required to satisfy Appendix R and identifies the major systems used to satisfy the safe shutdown performance goals. Tabular lists of required mechanical and electrical equipment and components are also included.

Part IV of the FPR, Alternate Shutdown Capability, identifies and describes the methodology used to demonstrate compliance with 10 CFR 50 Appendix R Section III.G.3 and III.L for alternative shutdown given a fire in the control building.

Part V of the FPR, Emergency Lighting and Reactor Coolant Pump Oil Collection, documents the methodology used to satisfy 10 CFR 50 Appendix R Section III.J and III.O. It describes the reactor coolant pump oil collection system and the adequacy of emergency lighting for areas needed for manual operation of safe shutdown equipment.

Part X of the FPR, Fire Hazards Analysis Report, discusses and provides references to the results of the fire hazards and safe shutdown analyses performed for fire areas and rooms. The results are documented on a fire area basis, broken down into separate discussions of fire protection features and safe shutdown analyses for each area.

Based on the review of the SQN current licensing bases for fire protection, the system intended functions performed in support of 10 CFR 50.48 requirements were determined. Section 2.3 contains the results of the review of the SQN mechanical systems and identifies systems that contain passive mechanical components that support at least one of the following required functions:

- Provide fire protection in accordance with 10 CFR 50 and BTP APCSB 9.5-1, Appendix A, and to meet the intent of 10 CFR 50, Appendix R.
- Assure safe shutdown of the plant, as assumed by the safe shutdown capability analysis, in the event of a fire in accordance with 10 CFR 50, Appendix R (such as the reactor coolant system, residual heat removal system, essential raw cooling water system, etc.).

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). Section 2.4 contains the results of the scoping review for the SQN 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)

Regulation 10 CFR 50.49 defines 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. The TVA environmental qualification (EQ) program administrative procedure controls the maintenance of the list of EQ components contained within the equipment database. The list of EQ components 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)

"Fracture Toughness Requirements for Protection Against Pressurized Thermal Shock Events," 10 CFR 50.61, requires that licensees of pressurized water reactors (PWRs) 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 value, RT_{PTS} (reference temperature for pressurized thermal shock), which is compared to pressurized thermal shock (PTS) screening criteria specified in the rule.

RT_{PTS} values have been extrapolated through the period of extended operation, or 52 effective full power years (EFPY). For both SQN Unit 1 and Unit 2, 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 vessels.

For both units, 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.

In response to NRC requirements, SQN Unit 1 and Unit 2 were modified to incorporate features to protect against ATWS. These provisions are the ATWS mitigation system actuation circuitry (AMSAC), described in Section 7.7.1.12 of the UFSAR. The AMSAC system for each unit provides a means diverse from the reactor protection system to trip the turbine and start the auxiliary feedwater pumps.

Based on SQN current licensing bases for ATWS, system intended functions performed in support of 10 CFR 50.62 requirements were determined. No mechanical systems perform an intended function in support of ATWS requirements.

The individual structure scoping evaluations in Section 2.4 contain the results of the review for the SQN 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.

The UFSAR summarizes the licensing bases for SBO at SQN (e.g., Sections 5.2.1.1, 8.3.1.1, 8.3.2.1, 10.4.7.2). SQN 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. Individual system scoping evaluations in Section 2.3 contain the results of the review for SQN mechanical 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 SQN 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. 2.1-6) 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 SQN 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.

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.

For directly connected components, appropriate LRA drawings 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, 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 base-mounted component, flexible connection, or the end of a piping run (such as a vent or drain line).

(4) A boundary supported by design documents, such as piping stress analyses.

(5) A point where buried piping exits the ground.

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. 2.1-6)

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, dikes, 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 SQN UFSAR 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 SQN 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.

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, 2.3.2.5, 2.3.3.17 and 2.3.4.3).

Leakage or Spray

For nonsafety-related systems with the potential for spatial interaction with safety-related components, a spaces approach was used to identify components subject to aging management review. Components containing water, oil, or steam and located in spaces containing safety-related equipment were subject to aging management review.

The following structures (and therefore spaces within them) contain safety-related components.

- Additional diesel generator building[1]
- Auxiliary building
- Additional equipment building (or auxiliary building addition) Unit 1
- Additional equipment building (or auxiliary building addition) Unit 2
- Condensate demineralizer waste evaporator building
- Condenser cooling water (CCW) pump station and retaining walls (or intake pump station)
- Control bay (or control building)
- Diesel generator building
- East steam valve room Unit 1
- East steam valve room Unit 2
- Essential raw cooling water (ERCW) discharge box
- ERCW protective dike
- ERCW pumping station and access cells
- Manholes, handholes and duct banks
- Radiation monitoring station Unit 1
- Radiation monitoring station Unit 2
- Reactor building Unit 1
- Reactor building Unit 2
- Refueling water storage tank foundation and pipe tunnel Unit 1
- Refueling water storage tank foundation and pipe tunnel Unit 2
- Turbine building

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.

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1. Blind flanges are installed where safety-related ERCW piping emerges through the base slab floor, and a missile protection structure is installed over the blind flanges. See Section 2.4.3, discussion of additional diesel generator building.

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 basis documents (UFSAR, design criteria 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. 2.1-6) provides guidelines for determining the intended functions of structures, structural components and commodities.

Structural component and commodity intended functions include providing shelter or 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 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. SQN electrical commodity groups were compared to the NEI 95-10, Appendix B electrical and I&C commodity groups. SQN passive electrical commodity groups correspond to Items 77 and 87 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.

Switchyard commodities are not included in the SQN equipment database because Transmission Support is responsible for their maintenance. However, as previously identified in Section 2.1, 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 (corresponds to Item 77 of NEI 95-10, Appendix B).
- Transmission conductors and connections (corresponds to Item 77 of NEI 95-10, Appendix B).

The commodity group “cables and connections, bus, electrical portions of electrical and I&C penetration assemblies, fuse holders outside of cabinets of active electrical components” is subdivided as shown in Table 2.5-1. Other SQN 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 are elements, resistance temperature detectors, sensors, thermocouples, transducers, solenoid valves, and heaters. 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) that 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 components are not subject to aging management review. EQ electrical components are covered by analyses or calculations that may be time-limited aging analyses (TLAAs) as defined in 10 CFR 54.3.

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 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 SQN comply with the applicable safety standards (e.g., BTP-APCSB 9.5.1; National Fire Protection Association document 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 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, these consumables do not require an aging management review.

2.1.3 Interim Staff Guidance Discussion

As discussed in NEI 95-10 (Ref. 2.1-6), 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. 2.1-8, 2.1-9) 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), and NEI 95-10. The remaining ISGs are addressed as follows.

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

This ISG recommends that applicants for license renewal follow the guidance provided in NEI 05-01 (Ref. 2.1-7) when preparing SAMA analyses as part of a license renewal application. This guidance was followed in preparing the SQN SAMA analysis presented in Appendix E of this application.

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

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 EPRI 1019038, *Steam Generator Integrity Assessment Guidelines*. The SQN Steam Generator Integrity Program (Section B.1.39) 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.1.4.

LR-ISG-2011-04 (Draft) 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.1.34.

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.

LR-ISG-2012-01 (Draft) 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). Due to the indeterminate nature of this draft ISG and the timing of its issuance, it was not feasible to include guidance from this draft ISG into the SQN License Renewal Application. However, site operating experience with non-FAC erosion-corrosion was reviewed and has been factored into the aging management results presented in Section 3.

2.1.4 Generic Safety Issues

In accordance with the guidance in NEI 95-10 (Ref. 2.1-6), review of NRC generic safety issues (GSIs) as a 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 (Ref. 2.1-5) determined that there were no outstanding USIs or High- or Medium-priority GSIs. Two GSIs designated as Active, 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.

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 SQN.

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 SQN license renewal process.

2.1.5 Conclusion

The methods described in Sections 2.1.1 and 2.1.2 were used at SQN 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. August 2010.

2.1-6 *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.

2.1-7 *Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document*. NEI 05-01. Nuclear Energy Institute. Revision A. November 2005.

2.1-8 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.

2.1-9 *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.

2.2 PLANT LEVEL SCOPING RESULTS

Tables 2.2-1-A, 2.2-1-B, and 2.2-3 list the mechanical systems, electrical and I&C systems, and structures, respectively, that are within the scope of license renewal for SQN. 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 UFSAR 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 2.2-4 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 UFSAR that describes the system or structure. For structures with no UFSAR 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 SQN 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-A. 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 2.3.2.4. For each system, the discussion under “Components Subject to Aging Management Review” provides further information.

As described in the UFSAR, 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. The (a)(2) system reviews are presented at the end of the mechanical system sections: Section 2.3.1.5, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2); Section 2.3.2.5, Miscellaneous

ESF Systems in Scope for 10 CFR 54.4(a)(2); Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2); and Section 2.3.4.3, Miscellaneous 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 the UFSAR, general site plan UFSAR Figure 2.1.2-1, plant layout drawing, fire hazards analysis, design criteria documents (DCDs), and maintenance rule basis document. Structure intended functions are identified in the section referenced in Table 2.2-3. 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-A
Mechanical Systems Within the Scope of License Renewal

System Code	System Name	LRA Section Describing System
001	Main Steam System	Section 2.3.4.1, Main Steam
002	Condensate System	Section 2.3.4.2, Main and Auxiliary Feedwater
003	Main and Auxiliary Feedwater (FW) System	Section 2.3.4.2, Main and Auxiliary Feedwater
005	Extraction Steam System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
006	Heater Drains and Vents System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
007	Turbine Extraction Traps and Drains System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
012	Auxiliary Boiler System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
014	Condensate Demineralizer System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
015	Steam Generator Blowdown System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
018	Fuel Oil System	Section 2.3.3.1, Fuel Oil
020	Central Lubricating Oil System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
024	Raw Cooling Water System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
025	Raw Service Water System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
026	High Pressure Fire Protection System	Section 2.3.3.2, High Pressure Fire Protection Section 2.3.3.3, Fire Protection CO_2 and RCP Oil Collection

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

System Code	System Name	LRA Section Describing System
027	Condenser Circulating Water System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
028, 928	Water Treatment System and Makeup Water Treatment Plant	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
029	Potable (Treated) Water Distribution System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
030, 031, 044, 300, 311, 312, 313, 440	Heating, Ventilating and Air Conditioning (HVAC) Systems	Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems Section 2.3.3.6, Control Building HVAC Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
032, 033	Control Air System and Service Air System	Section 2.3.3.7, Compressed Air
034	Vacuum Priming System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
035	Generator Cooling System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
036	FW Secondary Treatment System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
037	Gland Seal Water System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
039	Carbon Dioxide Storage, Fire Protection and Purging System	Section 2.3.3.3, Fire Protection CO_2 and RCP Oil Collection
040, 305	Station Drainage System and Sewage System	Section 2.3.3.8, Station Drainage
041	Layup Water Treatment System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
043	Sampling and Water Quality System	Section 2.3.3.9, Sampling and Water Quality

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

System Code	System Name	LRA Section Describing System
046	Feedwater Control System	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
047	Turbogenerator Control System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
050	Hypochlorite System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
052	System Test Facility (Instrumentation)	Section 2.3.2.4, Containment Penetrations
054	Injection Water System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
059, 959	Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
061	Ice Condenser System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
062	Chemical and Volume Control System	Section 2.3.3.10, Chemical and Volume Control
063	Safety Injection System	Section 2.3.2.1, Safety Injection
065	Emergency Gas Treatment System	Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems
067	Essential Raw Cooling Water System	Section 2.3.3.11, Essential Raw Cooling Water
068	Reactor Coolant System	Section 2.3.1, Reactor Coolant System
070	Component Cooling System	Section 2.3.3.12, Component Cooling
072	Containment Spray System	Section 2.3.2.2, Containment Spray
074	Residual Heat Removal System	Section 2.3.2.3, Residual Heat Removal
077	Waste Disposal System	Section 2.3.3.13, Waste Disposal
078	Spent Fuel Pit Cooling System	Section 2.3.3.14, Spent Fuel Pit Cooling
079	Fuel Handling and Storage System	Section 2.3.3.14, Spent Fuel Pit Cooling

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

System Code	System Name	LRA Section Describing System
081	Primary Water Makeup System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
082	Standby Diesel Generator System	Section 2.3.3.15, Standby Diesel Generator
084	Flood Mode Boration Makeup System	Section 2.3.3.16, Flood Mode Boration Makeup
085	Control Rod Drive System	Section 2.3.1.1, Reactor Vessel
087	Upper Head Injection System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
088	Containment Isolation System	Section 2.3.2.4, Containment Penetrations
090	Radiation Monitoring System	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
094	Incore Instrumentation (Flux/ Thermocouples and Subcooled Margin Monitor) System	Section 2.3.1.1, Reactor Vessel
302	Penetration and Sleeves System	Section 2.3.2.4, Containment Penetrations

Table 2.2-1-B
Plant Electrical and I&C Systems Within the Scope of License Renewal

System Code	System Name	UFSAR Reference
013	Fire Detection System	Section 9.5.1
046	Feedwater Control System	Section 7.7.1.7
047	Turbogenerator Control System	Section 10.2.2
055	Annunciator and Sequential Events Recording System	None
056	Temperature Monitoring System	None
057	Generator and Associated Electrical Systems	Section 10.2.2
085	Control Rod Drive System	Section 7.7.1.2
090	Radiation Monitoring System	Section 11.4
092	Neutron Monitoring System	Section 7.2.1.1.2
094	Incore Flux/Thermocouples and Subcooled Margin Monitor System	Section 7.7.1.9
099	Reactor Protection System	Section 7.2
200	Status Monitoring System	Section 7.1.4.3
201	Low Voltage Power System	Section 8.3.1
202	Medium Voltage Power System	Section 8.3.1
209	Turbine Building Motor-Operated Valve Power System	None
234	Heat Trace System	None
241	Switchyard and Transformers (22.5, 161 and 500 KV) System	Section 8.2
244	Communications System	Section 9.5.2
247	Lighting System	Section 9.5.3
250	Low Voltage AC/DC Power System	Section 8.3
255	Data Acquisition Equipment System	Section 2.3.3.2
264	Technical Support Center System	Section 7.1.4
268	Hydrogen Mitigation System	Section 6.2.5A
301	Computers and Recorders System	Section 7.1.4

Table 2.2-1-B (Continued)
Plant Electrical and I&C Systems Within the Scope of License Renewal

System Code	System Name	UFSAR Reference
306	Misc Office Equipment System	None
317	Power Outlets System	None
361	Cables System	None
500	Control Room Auxiliary Instruments and Local Panels System	None

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

System Code	System Name	UFSAR Reference
038	Insulating Oil System	None
042	Chemical Cleaning System	None
049	Breathing Air System	None
051	Acrolein System	None
058	Generator Bus Cooling System	None
083	Hydrogen Recombination System	Section 6.2.5B
245	Security System	None
282	Field Services Facility Electrical System	None

Table 2.2-3
Structures Within the Scope of License Renewal

Structure Name	LRA Section
Additional diesel generator building	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Auxiliary building	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Additional equipment building (auxiliary building addition), Unit 1	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Additional equipment building (auxiliary building addition), Unit 2	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Carbon dioxide storage building	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Condensate demineralizer waste evaporator building	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Condensate storage tanks' foundations and pipe trench	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Condenser cooling water pump station (intake pump station) and retaining walls	Section 2.4.2, Water Control Structures
Condenser cooling water pumping station intake channel	Section 2.4.2, Water Control Structures
Control bay (control building)	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Cranes, trolleys, monorails, and hoists	Each is evaluated with the structure that houses it.
Diesel generator building	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
East steam valve room, Unit 1	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
East steam valve room, Unit 2	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Essential raw cooling water discharge box	Section 2.4.2, Water Control Structures
Essential raw cooling water protective dike	Section 2.4.2, Water Control Structures
Essential raw cooling water pumping station and access cells	Section 2.4.2, Water Control Structures

Table 2.2-3 (Continued)
Structures Within the Scope of License Renewal

Structure Name	LRA Section
High pressure fire protection pump house and water storage tanks' foundations	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Manholes, handholes and duct banks	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Radiation monitoring station, Unit 1	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Radiation monitoring station, Unit 2	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Reactor buildings	Section 2.4.1, Reactor Building
Refueling water storage tank foundation and pipe tunnel, Unit 1	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Refueling water storage tank foundation and pipe tunnel, Unit 2	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Skimmer wall, skimmer wall dike A and underwater dam	Section 2.4.2, Water Control Structures
Transformer and switchyard support structures and foundations	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Turbine building	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
Waste packaging area	Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures

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

Structure Name	Structure Function or UFSAR Reference
Access control portal	Provide a secure entry and exit point of the plant protected area.
Acid storage tank building	Provide support for the acid storage tank and associated equipment.
Acrolein (ACRO) facility	Provide a satellite storage area for hazardous waste.
Alum sludge ponds	Provide a retention impoundment for settling out of backwashed particulate from various plant system operations.
Auxiliary essential raw cooling water (AERCW) cooling towers' foundations	The AERCW cooling towers have been removed and only the foundations that supported the cooling towers remain.
AERCW pump structure	The entire AERCW system has been abandoned, eliminating the need for this pump structure.
Central alarm station	House plant security in support of site security operations.
Chlorine contact tank foundation	Abandoned in place.
Condensate demineralizer building	Section 10.4.6.2
Cooling tower gate structures	Provide a path for discharge water from the condenser circulating water system to be returned to the river.
Cooling tower supply pumping station	Provide assistance to the natural draft cooling towers for circulating water from the main condenser.
Cooling tower, Unit 1 (natural draft)	Section 2.2.3.7, Section 10.4.5.3
Cooling tower, Unit 2 (natural draft)	Section 2.2.3.7, Section 10.4.5.3
Cooling tower valve vault	Provide an area for valves associated with the cooling tower.
Decontamination facility (hypochlorite building)	Provide housing of decontamination equipment.
Demineralized water storage tank foundation	Foundation for the demineralized water storage tank, which provides storage for processed water from the makeup water treatment system.
Design services buildings complex	Provide offices for power supply personnel, security administration, classrooms, supplies, health physics in-processing, and miscellaneous office space.

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

Structure Name	Structure Function or UFSAR Reference
Discharge channels	Provide a conveyance path for the discharge of waste heat water from the condensers (CCW discharge channel) or from the cooling towers.
Discharge gate structure	Section 10.4.5.3
Dry cask transporter building	Provide a storage facility for the dry cask transporter used to transport HI-STORM 100 storage system casks from the plant to the independent spent fuel storage installation storage pads.
Essential raw cooling water settling pond	Provide a settling pond for dredge effluent from the Tennessee River during dredging operation of the intake channel to ERCW pumping station.
Excess solid waste storage area	Provide a storage location for the site excess solid waste.
Field services facility	Provide office facilities for site personnel.
Fire equipment and yard storage building	Provide a storage location for the site fire fighting equipment and miscellaneous yard equipment.
Fire equipment houses	Provide space for support of the site fire fighting equipment.
Fire operations center (temp office building)	Provide a location for fire operation and safety engineering offices and for storage of the site's fire-fighting equipment.
Fuel oil storage tanks’ foundations	Provide support for two fuel oil storage tanks with a capacity of 70,000 gallons each; the tanks provide an alternate supply of fuel oil for the standby diesel generators (also known as the emergency diesel generators).
Hydrogen trailer port and pipe trench	Section 9.5.8.2
Independent spent fuel storage installation pad	Section 9.1.5
Insulating oil tanks’ foundations	Provide support for the insulating oil tanks for station transformers. These tanks are no longer in service and are abandoned in place.
Intake and discharge conduits	Provide a flow path for the circulating water supply from the CCW pumping station, through the turbine building, to the discharge structure.
Layup water holdup tank	Provide support for the layup water holdup tank. The tank serves as a mix/hold area for borated water used for the transfer canal and/or spent fuel pit.

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

Structure Name	Structure Function or UFSAR Reference
Low level radwaste storage facility	Section 11.5.6.3
Lube oil instrument storage building	Provide space for support of the site lube oil system monitoring equipment.
Lube oil tanks' foundations	Provide support for two lube oil tanks that provide storage for clean and dirty lube oil.
Makeup water treatment building	Section 9.2.3
Meteorological towers and environmental data station	Section 2.3.3
Modifications facility	Provide miscellaneous supply and storage space, shop space for plant modification activities, and office space for site personnel.
Multi-purpose building	Provide meeting rooms, some plant security offices, and general workspace for outage worker overflow.
Nitrogen storage tank foundation	Provide support for the nitrogen tank and associated equipment.
NRC office	Provide office space for meetings and office space for the resident inspector and staff.
Office/cafeteria building	Provide office space for main plant personnel and a food services facility for plant personnel.
Office and power stores facility	Provide office space for site administration, document control, procurement and power stores, engineering, and other staff personnel.
Paint storage building	Provide space for paint storage.
Ponds	There are five ponds: yard drainage pond, metal cleaning waste pond (lined), metal cleaning waste pond (unlined), low level waste treatment pond, and diffuser pond. The ponds provide a retention impoundment of storm water runoff, rain water, or water from building sumps or provide the hydraulic head to discharge water through the diffuser system.
Primary water tank foundation, Unit 1	Provide support for a 187,000-gallon water storage tank, which supplies water for various makeup and flushing operations.
Primary water tank foundation, Unit 2	Provide support for a 187,000-gallon water storage tank, which supplies water for various makeup and flushing operations.

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

Structure Name	Structure Function or UFSAR Reference
Security backup power building	Provide structural support for the site's security backup diesel generator.
Septic tank and pump foundation	Provide support for the site's waste water and sewage system.
Service building	Provide office space for maintenance, operations, and planning personnel and janitorial offices and maintenance shops for site personnel.
Sewage analysis house	Provide space for support of the site sewage system and equipment.
Sewage treatment facility	Provide an area for support of the site sewage system and equipment.
SQN livewell center	Provide a fitness center for TVA personnel.
SQN training center	Provide office space for the site training staff and training classrooms for site personnel, including the SQN simulator.
Steam generator storage building	Provide a storage facility for the original Unit 1 steam generators removed during the steam generator replacement project.
Storage building	Provide workshop and storage areas for site personnel.
Telephone equipment house	Provide space for telephone switchgear equipment.
Temporary egress access control portal (TEACP) building	Provide miscellaneous office and storage space for personnel.
Temporary power stores and maintenance warehouse	Provide support services for site maintenance activities.
Warehouses	Provide miscellaneous storage and shop space for plant maintenance and modification activities and office space for site personnel.

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 Reactor Coolant System

System Description

The reactor coolant system (RCS) (system code 068) consists of four similar heat transfer loops connected in parallel to the reactor vessel. Each loop contains a reactor coolant pump and a steam generator. The system also includes a pressurizer, pressurizer relief tank, connecting piping, and instrumentation necessary for operational control. The reactor coolant system transfers the heat generated in the core to the steam generators, where steam is produced to drive the turbine generator. Cooling water is circulated at the flow rate and temperature consistent with achieving the reactor core thermal-hydraulic performance. The water also acts as a solvent for the neutron absorber used in chemical shim control and as a neutron moderator and reflector. The reactor coolant system provides a boundary for containing the coolant under operating temperature and pressure conditions. It confines radioactive material and limits, to acceptable values, its uncontrolled release to the secondary system and other parts of the plant. The inertia of the reactor coolant pumps provides the necessary flow during a pump coast-down. The layout of the system assures natural circulation capability following a loss of forced flow to permit decay heat removal without overheating the core. Part of the RCS piping is used by the safety injection system to deliver cooling water to the core during a loss-of-coolant accident.

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

- Remove sensible and decay heat from the reactor core via natural circulation or forced circulation following design basis accidents.
- Provide a boundary for containing the coolant under operating temperature and pressure conditions and for limiting leakage (and activity release) to the containment atmosphere.
- Provide the capability to vent non-condensable gases from the RCS.
- Provide hot and cold overpressure protection for the reactor vessel and other RCS components.
- Provide structural support and alignment for the reactor core, reactivity control components, and instrumentation.
- Provide a path for coolant to the core following a loss of coolant accident (LOCA).
- Support containment pressure boundary.
- Support the component cooling system (CCS) and essential raw water cooling (ERCW) system pressure boundaries.

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

- Support the evaluation for pressurized thermal shock (10 CFR 50.61).
- Maintain RCS pressure boundary and provide core cooling and removal of sensible heat during a safe shutdown following a fire (10 CFR 50.48) or during station blackout (10 CFR 50.63).

UFSAR References

Chapters 4 and 5

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 (reactor coolant pumps, pressurizer, pressurizer relief tank, and RCS piping and valves).
- Section 2.3.1.4, Steam Generators

System valves supporting the containment isolation boundary of the waste disposal system nitrogen supply line to the pressurizer relief tank are reviewed in Section 2.3.3.13, Waste Disposal.

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, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2).

2.3.1.1 Reactor Vessel

Description

The aging management review of the reactor vessel includes the control rod drive (CRD) system and the incore instrumentation system.

Reactor Vessel

The reactor vessel was designed in accordance with Section III (Nuclear Vessels) of ASME Boiler and Pressure Vessel Code. The reactor vessel is cylindrical in shape with a hemispherical bottom head and a removable, bolted flanged and gasketed, hemispherical upper head. The upper reactor closure head and the reactor vessel flange are joined by studs. The reactor vessel closure region is sealed by two hollow metallic O-rings. Seal leakage is detected by means of two leakoff connections, one between the inner and outer ring and one outside the outer O-ring. The vessel contains the core, core support structure, control rods, and other parts directly associated with the core. The reactor vessel closure head contains the control rod drive mechanism (CRDM) and upper head injection head adaptors. The bottom head of the vessel contains penetrations for connection and entry of the nuclear incore instrumentation. The vessel has inlet and outlet nozzles located in a horizontal plane just below the reactor vessel flange but above the top of the core. Coolant enters the vessel through the inlet nozzles and flows down the core barrel-vessel wall annulus, turns at the bottom and flows up through the core to the outlet nozzles.

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

Control Rod Drive

The purpose of the CRD system (system code 085) is to insert, withdraw, or hold rod cluster control assemblies within the core to control average core temperature and to shut down the reactor. The system provides reactivity control to compensate for the rapid short-term variations in reactivity. The full length rods are divided into two functional categories, the shutdown rod and the control rods. The shutdown rods are fully withdrawn prior to criticality and serve only to provide a large amount of shutdown reactivity when a reactor trip is initiated. The control banks provide shutdown reactivity on a trip but also provide the reactivity control needed for operation.

The system includes the rod cluster control assemblies, the control rod drive mechanisms, motor-generator sets, and the related power supplies, instrumentation and controls. The control rod drive mechanism forms part of the reactor vessel pressure boundary.

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

- Provide reactor coolant system pressure boundary integrity.
- Release the control rods upon receipt of a reactor trip signal to ensure rapid shutdown and reactivity control.

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

Incore Instrumentation

The purpose of the incore instrumentation system (system code 094) is to provide information on the neutron flux distribution and fuel assembly outlet temperatures at selected core locations. The information obtained from the incore instrumentation system is used to confirm the reactor core design parameters and calculated hot channel factors. The system provides means for acquiring data and performs no operational plant control.

The incore instrumentation system includes thermocouples positioned to measure fuel assembly coolant outlet temperature and the provisions for inserting and supporting the thermocouples in the reactor vessel, consisting of the thermocouple guide tubes and associated reactor vessel head seal assemblies. This system also includes the reactor coolant system subcooling margin monitors, which use the incore thermocouples and wide range pressure to determine the amount of saturation in the reactor coolant system.

The system includes incore flux thimbles to permit insertion of movable miniature fission chamber detectors for measurement of the neutron flux distribution within the reactor core. The retractable thimbles, into which the miniature detectors are driven, are pushed into the reactor core through conduits which extend from the bottom of the reactor vessel down through the concrete shield area and then up to a thimble seal table. The thimbles, closed at the leading ends, are dry inside and serve as the pressure barrier between the reactor water pressure and the containment atmosphere. Mechanical seals between the retractable thimbles and the conduits are provided.

The system includes the provisions for inserting and supporting the flux detectors in the reactor vessel, consisting of the flux detector thimble tubes, guide tubes, seal table, and the incore drives, drive motors, positioning equipment, and instruments. The thermocouple head penetration seal assemblies, flux thimbles, seal table, and guide tubes form part of the reactor coolant pressure boundary.

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

- Maintain integrity of reactor coolant pressure boundary.

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

UFSAR References

Section 5.4

Section 4.2.3

Section 4.4.5.1

Section 7.7.1.9

Components Subject to Aging Management Review

The following subassemblies of the reactor vessel are subject to aging management review: closure head, CRDM assembly, vessel external attachments, vessel internal attachments, vessel shell, bottom head, bottom-mounted instrumentation, and nozzles, safe ends and welds.

The rod cluster control assemblies are periodically replaced based on neutron exposure and 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-1,2-47W813-1

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

Component Type	Intended Function
Bolting • Core exit thermocouple nozzle assemblies (CETNA) assembly hold-down nuts/compression collar • Canopy seal cap screws	Pressure boundary
Bottom-mounted instrumentation • Flux thimble guide tubes • Seal table • Flux thimble tubes and bullet plugs	Pressure boundary
Closure head • Closure head dome • Top head ring • Auxiliary head adapter • Vent pipe penetration • CRDM housing penetration • Auxiliary head adapter canopy seal weld overlay • Auxiliary head adapter cap • Vent pipe penetration safe end and weld • Studs, nuts and washers	Pressure boundary
Closure head • Dummy cans	Structural support
Closure head • Flange	Pressure boundary Structural support
Control rod drive penetration adapters • CRDM housing adapter • CRDM latch housing • CRDM rod travel housing • CETNA • Head adapter plugs • Canopy seal assembly	Pressure boundary

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

Component Type	Intended Function
Nozzles • Inlet/outlet • Inlet/outlet safe ends and welds	Pressure boundary
Vessel external attachments • Vessel support pads • Vent shroud support lugs	Structural support
Vessel internal attachments • Core support pads	Structural support
Vessel shell (including welds) • Upper shell • Intermediate shell • Lower shell • Bottom head ring • Bottom head spherical ring	Pressure boundary
Vessel shell • Vessel flange	Pressure boundary
Bottom head • Bottom head cap	Pressure boundary
Bottom head cap • Instrumentation tubes and welds • Instrumentation tubes safe ends	Pressure boundary

2.3.1.2 Reactor Vessel Internals

Description

The reactor internals support the core, maintain fuel alignment, limit fuel assembly movement, maintain alignment between fuel assemblies and control rod drive mechanisms, direct coolant flow past the fuel elements, direct coolant flow to the pressure vessel head, provide gamma and neutron shielding, and provide guides for the incore instrumentation. The components of the reactor internals consist of the lower core support structure, the upper core support structure, and the incore instrumentation support structure. The lower core support structure consists of the core barrel, the core baffle, the lower core plate and support columns, the thermal shield, and the core support, which is welded to the core barrel. The upper core support structure consists of the upper support assembly and the upper core plate, between which are contained support columns and guide tube assemblies. The incore instrumentation support structures consist of an upper system to convey and support thermocouples penetrating the vessel through the head, and a lower system to convey and support flux thimbles penetrating the vessel through the bottom.

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

UFSAR References

Section 4.2.2

Components Subject to Aging Management Review

The lower core support structure, the upper core support structure, and the incore instrumentation 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 connectors components • Bolts, studs, nuts, washers • Locking bars, caps and keys • Dowels • Cap screws • Tie straps • Baffle-to-former bolts • Baffle edge bolts • Barrel-to-former bolts • Bottom-mounted instrumentation (BMI) column nuts and bolts • Lower core plate fuel alignment pin bolts and locking caps • Lower support column bolts • Thermal shield bolts • Clevis insert bolts	Structural support
Upper Core Support Assembly	
Control rod guide tube assembly and downcomer • Upper guide tube enclosures • Housing plates • Inserts • Support pin cover plate • Water flow slot ligaments • C-tubes • Enclosure pins • Sheaths	Structural support Flow distribution
Control rod guide tube assembly and downcomer • Guide cards and plates • Guide tube support pins (split pins) • Flanges intermediate • Flanges lower • Lower flange welds	Structural support
Upper head injection • Flow column	Structural support Flow distribution

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

Component Type	Intended Function
Upper core plate and fuel alignment pins • Upper core plate	Structural support Flow distribution
Upper core plate and fuel alignment pins • Fuel alignment pins	Structural support
Upper support column assembly • Adapters • Column bodies • Extension tubes • Flanges	Structural support Flow distribution
Upper support column assembly • Column bases	Structural support
Upper support plate assembly • Flange • Upper support plate • Upper support plate ring or skirt	Structural support Flow distribution
Lower Core Support Structure	
Baffle and former assembly: • Baffle plates • Former plates and corner brackets	Structural support Flow distribution
Core barrel • Upper core barrel flange (base metal) • Upper core barrel flange weld • Lower core barrel flange weld • Upper core barrel and lower core barrel circumferential (girth) welds	Structural support
Core barrel • Core barrel outlet nozzle welds • Upper and lower core barrel axial (vertical) welds • Lower core barrel • Upper core barrel	Structural support Flow distribution
Diffuser plate	Structural support Flow distribution

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

Component Type	Intended Function
Head cooling spray nozzles	Flow distribution
Lower core plate and fuel alignment pins • Fuel alignment pins	Structural support
Lower core plate and fuel alignment pins • Lower core plate	Structural support Flow distribution
Lower support column assemblies • Lower support column bodies • Lower support column sleeve	Structural support
Lower core support plate	Structural support
Thermal shield	Structural support Shielding Flow distribution
Thermal shield • Thermal shield flexures	Structural support
Radial support keys	Structural support
Secondary core support assembly • Secondary core support plate • Secondary core support energy absorber • Secondary core support guide posts • Secondary core support housing	Structural support
Interfacing components • Clevis inserts • Head and vessel alignment pins • Internals hold-down spring • Upper core plate alignment pins	Structural support

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

Component Type	Intended Function
Incore Instrumentation Support Structure	
Upper instrumentation conduit and supports • Brackets • Clamps • Terminal blocks • Conduit straps	Structural support
Upper instrumentation conduit and supports • Conduit seal assembly – body, tube sheets, tubes • Conduits • Flange bases • Support tubes	Structural support
BMI column bodies • BMI column collars • BMI column extension bars • BMI column extension tubes • BMI column bodies • BMI column cruciforms	Structural support

2.3.1.3 Reactor Coolant Pressure Boundary

Description

This section summarizes the aging management review of ASME Section XI Code Class 1 components of the reactor coolant pressure boundary (RCPB), including the pressurizer, and other non-Class 1 components of the RCS, with the exception of the reactor vessel, reactor vessel internals, and steam generators (see Section 2.3.1.1, Section 2.3.1.2, and Section 2.3.1.4, respectively). The 10 CFR 50.2 definition of the RCPB includes all pressure retaining components such as pressure vessels, piping, pumps, and valves that are

a. Part of the reactor coolant system, or

b. Connected to the reactor coolant system, 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 reactor coolant system safety/relief valve piping.

For SQN, ASME Code Class 1 boundaries fall within the RCPB in accordance with the provisions of 10 CFR 50.55a(c)(2) (see UFSAR Section 3.2.2.5). Components within these Class 1 boundaries are included in this review with the exception of the major components evaluated in the sections referenced above.

The major Class 1 components of the reactor coolant pressure boundary included in this review are the reactor coolant pumps (RCP), reactor coolant piping, pressurizer, pressurizer relief valves, and the Class 1 portions (piping and valves) of the following systems connected to the RCS: safety injection (system code 063), residual heat removal (system code 074), and chemical and volume control system (CVCS) (system code 062) (see Section 2.3.2.1, Section 2.3.2.3, and Section 2.3.3.10, respectively, for further review of these systems).

The Class 1 boundaries for SQN generally align with the TVA Class A boundaries as shown on the LRA drawings listed below. Where the TVA Class A boundary extends beyond the Class 1 boundary, the additional components in the TVA Class A boundary were also included in this review. In other words, this review evaluated components within the TVA Class A and ASME Class 1 boundaries.

This aging management review also includes non-Class 1 components of the RCS (system code 068) that have an intended function for license renewal but were not included in another review.

Each reactor coolant loop contains a vertical single-stage centrifugal pump that employs a controlled leakage seal assembly. Reactor coolant is pumped by the impeller attached to the bottom of the rotor shaft. The coolant is drawn up through the impeller, discharged through passages in the diffuser and out through a discharge nozzle in the side of the casing. A flywheel at the top of the rotor shaft extends the pump coastdown flow in the event of a loss of power to the pump motor. A portion of the flow from the CVCS charging pumps is injected into the reactor coolant pump between the impeller and the controlled leakage seal. CCS water is supplied to the motor bearing oil coolers and the thermal barrier cooling coil. ERCW is supplied to the motor air coolers.

Pressure in the system is controlled by the pressurizer, where water and steam pressure is maintained through the use of electrical heaters and sprays. Steam can either be formed by the heaters or condensed by a pressurizer spray to minimize pressure variations due to contraction and expansion of the coolant. The RCS is protected against overpressure by control and protective circuits such as the high pressure trip and by code relief valves connected to the top head of the pressurizer. The relief valves discharge into the pressurizer relief tank, which condenses and collects the valve effluent. Two power operated relief valves and three code safety valves are provided to protect against pressure surges that are beyond the pressure limiting capacity of the pressurizer spray. The power operated relief valves are operated automatically or manually from the main control room. The power operated relief valves also operate to prevent RCS pressure from exceeding the limits during low temperature operation. Remotely operated stop valves are provided to isolate the power operated relief valves if excessive leakage occurs.

Discharge from smaller relief valves located inside and outside the containment is also piped to the pressurizer relief tank. The pressurizer relief tank is partially filled with water at or near ambient containment conditions. The tank normally contains water in a predominantly nitrogen atmosphere. Steam is discharged under the water level to condense and cool by mixing with the water. The tank is equipped with an internal spray and a drain which are used to cool the tank following a discharge. The tank is protected against a discharge exceeding the design value by rupture discs which discharge into the containment.

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

UFSAR References

Section 5.2

Section 5.5

Components Subject to Aging Management Review

System valves supporting the containment isolation boundary of the waste disposal system nitrogen supply line to the pressurizer relief tank are evaluated in Section 2.3.3.13, Waste Disposal. 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, Miscellaneous 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 (068)

LRA-1,2-47W813-1

LRA-1-47W859-2
LRA-2-47W859-3
(RCP oil coolers and thermal barrier heat exchangers)

LRA-1-47W845-3
LRA-2-47W845-3
(RCP cooling air heat exchangers)

Safety Injection System (063)

LRA-1-47W811-1
LRA-2-47W811-1

Residual Heat Removal System (074)

LRA-1, 2-47W810-1

Chemical & Volume Control System (062)

LRA-1-47W809-1
LRA-2-47W809-1

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

Component Type	Intended Function
Bolting	Pressure boundary
Flex connection	Pressure boundary
Heat exchanger (channel head) (RCP upper oil cooler)	Pressure boundary
Heat exchanger coil (RCP lower oil cooler)	Pressure boundary
Heat exchanger coil (thermal barrier)	Pressure boundary Heat transfer
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
Pressurizer heater sheath	Pressure boundary
Pressurizer heater wells and heater sheath to well welds	Pressure boundary
Manway cover	Pressure boundary
Manway insert plate	Pressure boundary
Pressurizer nozzles (spray nozzle, surge nozzle, relief and safety nozzle)	Pressure boundary
Pressurizer nozzle to safe-end welds including weld overlays	Pressure boundary

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

Component Type	Intended Function
Orifice	Pressure boundary Flow control
Piping ≥ 4" nominal pipe size (NPS)	Pressure boundary
Piping < 4" NPS	Pressure boundary
Piping (non-Class 1)	Pressure boundary
Piping (non-Class 1) (RCP lower oil cooler)	Pressure boundary
Piping (non-Class 1) (reactor vessel flange leak off lines)	Pressure boundary
Pressurizer instrument penetration	Pressure boundary
Pressurizer shell and heads	Pressure boundary
Pressurizer spray head	Flow control
Pressurizer spray head coupling and locking bar	Flow control
Pump casing (RCP and flange)	Pressure boundary
Safe end (spray, surge, relief and safety)	Pressure boundary
Scoop to coolant loop weld (spray line and resistance temperature detector (RTD))	Pressure boundary
Support	Structural support
Support lug	Structural support
Support skirt	Structural support
Thermal barrier	Pressure boundary
Thermal sleeve (piping, spray, surge)	Pressure boundary
Thermowell	Pressure boundary

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

Component Type	Intended Function
Tubing	Pressure boundary
Valve body ≥ 4” NPS	Pressure boundary
Valve body < 4” NPS	Pressure boundary
Valve body (non-Class 1)	Pressure boundary

2.3.1.4 Steam Generators

Description

Each reactor coolant loop contains a steam generator. Unit 1 and Unit 2 both use replacement steam generators (RSG). The Unit 1 RSGs were installed in 2003, and the Unit 2 RSGs were installed in 2012. The RSGs are vertical shell and U-tube evaporators with integral moisture separating equipment. The reactor coolant flows through the inverted tubes, entering and leaving through the nozzles located in the hemispherical bottom head of the steam generator. The head is divided into inlet and outlet chambers by a vertical partition plate extending from the head to the tube sheet. Manways are provided for access to both sides of the divided head. Steam is generated on the shell side and travels through swirl vanes and moisture separators to the outlet nozzle at the top of the vessel. Feedwater flows directly into the annulus formed by the shell and tube bundle wrapper before entering the boiler section of the steam generator. Subsequently, water-steam mixture flows upward through the tube bundle and into the steam drum section. A set of centrifugal moisture separators, located above the tube bundle, removes most of the entrained water from the steam. The moisture separators recirculate the separated water, which mixes with feedwater as it passes through the annulus formed by the shell and tube bundle wrapper. The steam drum has two access openings for inspection and maintenance of the dryers, which can be disassembled and removed through the opening.

As the interface between the reactor coolant, main feedwater, and main steam systems, the steam generators support functions of each of these systems. The steam generators perform the following intended functions for 10 CFR 54.4(a)(1).

To support the reactor coolant system (system code 068):

- Remove sensible and decay heat from the reactor core via natural circulation or forced circulation following design basis accidents.
- Provide a boundary for containing the coolant under operating temperature and pressure conditions and for limiting leakage (and activity release) to the containment atmosphere.

To support the main steam system (system code 001):

- Limit steam release to limit RCS cooldown following a steam line rupture.
- Provide steam to the auxiliary feedwater pump turbines to ensure decay heat removal.
- Support containment pressure boundary.

To support the main and auxiliary feedwater system (system code 003):

- Provide auxiliary feedwater flow to the steam generators to ensure decay heat removal during accident conditions.

The steam generators have no intended functions for 10 CFR 54.4(a)(2). However, some subcomponents of the steam generators do not directly support the safety functions of the steam generators and thus are not safety-related. These subcomponents, such as the steam separators and dryers, 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 steam generators perform the following intended functions for 10 CFR 54.4(a)(3).

To support the reactor coolant system (system code 068):

- The RCS is credited with maintaining its pressure boundary and providing core cooling and removal of sensible heat during a safe shutdown following a fire (10 CFR 50.48) or during station blackout (10 CFR 50.63).

To support the main steam system (system code 001):

- Provide capability to cool down RCS via steam discharge to atmosphere for the Appendix R event (10 CFR 50.48) or for station blackout (10 CFR 50.63).
- Provide steam to the auxiliary feedwater pump turbines during a safe shutdown following a fire (10 CFR 50.48) or during station blackout (10 CFR 50.63).

To support the main and auxiliary feedwater system (system code 003):

- Provide auxiliary feedwater flow to the steam generators to ensure decay heat removal for the Appendix R event (10 CFR 50.48) or for station blackout (10 CFR 50.63).

As part of the pressure boundary of the reactor coolant, main feedwater, and main steam systems, the steam generators indirectly support the other pressure boundary dependent functions of these systems. For further discussion of these other supported functions, see Section 2.3.1.3, Reactor Coolant Pressure Boundary; Section 2.3.4.2, Main and Auxiliary Feedwater; and Section 2.3.4.1, Main Steam.

UFSAR References

Section 5.5.2

Components Subject to Aging Management Review

Reactor coolant inlet and outlet piping is reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. Feedwater piping and components, including the feedwater inlet piping and steam generator level instrumentation, are reviewed in Section 2.3.4.2, Main and Auxiliary Feedwater. Main steam piping and components, including the main steam lines, steam generator blowdown lines, and main steam flow instrument pressure sensing lines, are reviewed in Section 2.3.4.1, Main Steam. The flow limiter insert in the main steam outlet nozzle, which is identified as a flow element in the main steam system code (001) (see Note 18 on Drawing LRA-1,2-47W801-1), is reviewed in this section. Insulation around the steam generators is evaluated as a structural commodity in Section 2.4.4, Bulk Commodities.

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 -1,2-47W813-1

Main Feedwater System

LRA-1,2-47W803-1

LRA-1,2-47W803-2

Main Steam System

LRA-1,2-47W801-1

LRA-1,2-47W801-2

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
Primary head	Pressure boundary
Primary divider plate and divider bar	Pressure boundary
Primary nozzle	Pressure boundary
Primary nozzle safe end	Pressure boundary
Primary nozzle-to-safe end weld	Pressure boundary
Nozzle dam clamp ring	Pressure boundary
Primary nozzle/manway drain tubes	Pressure boundary
Primary manway	Pressure boundary
Primary manway cover plate	Pressure boundary
Gasket retainer/diaphragm insert plate	Pressure boundary
Tubes	Pressure boundary Heat transfer
Tube plugs	Pressure boundary
Stabilizers	Structural support
Secondary shell (top head and steam outlet nozzle, upper, intermediate and lower shells and shell cone)	Pressure boundary
Flow limiter insert	Flow control
Feedwater nozzle	Pressure boundary

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

Component Type	Intended Function
Feedwater nozzle safe end	Pressure boundary
Feedwater nozzle thermal liner	Pressure boundary
Instrument and drain nozzles	Pressure boundary
Blowdown nozzle	Pressure boundary
Secondary manway, handholes, inspection ports, recirculation nozzle and cover plates	Pressure boundary
Secondary manway, handholes, inspection ports, recirculation nozzle and cover plate gasket sealing surfaces	Pressure boundary
External shell attachments	Pressure boundary
Small nozzle shim and clamp (SQN Unit 1)	Pressure boundary
Upper bundle (U-bend) support components (I-beam, arch plates, tube support bars and related components)	Structural integrity
Upper bundle (U-bend) support components	Structural integrity
Advanced tube support grid (ATSG) strips	Structural integrity
Upper and lower scalloped bar (SQN Unit 2)	Structural integrity
ATSG support components	Structural integrity
Shroud, shroud supports and attachments	Structural integrity
Recirculation piping and support components	Structural integrity

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

Component Type	Intended Function
Feedwater piping and support components	Structural integrity
Feedwater inserts, spray pipes and caps	Structural integrity
Blowdown pipe	Structural integrity
Blowdown pipe support components	Structural integrity
Separator support plate, stiffener rib and manway components	Structural integrity
Marman coupling	Structural integrity
Steam separators and supports	Structural integrity
Steam separator swirl vanes (spinners)	Structural integrity
Dryer support plate and related components	Structural integrity
Steam dryer frame, end plates and vanes	Structural integrity
Steam dryer drains	Structural integrity
Trunnion	Structural support
Support pads	Structural support

2.3.1.5 Miscellaneous 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 SQN, 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 oil, steam or liquid 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 reactor coolant system (system code 068) is within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions.

System Descriptions

The reactor coolant system is described in Section 2.3.1, Reactor Coolant System. Certain nonsafety-related components in the RCS 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.

UFSAR References

Chapters 4 and 5

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 base-mounted component, flexible connection, or the end of a piping run (such as a vent or drain line).

(4) A boundary supported by design documents, such as piping stress analyses.

(5) A point where buried piping exits the ground.

For spatial interaction, RCS system components containing oil, steam, or liquid 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.

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

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

License Renewal Drawings

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

LRA-1, 2-47W813-1

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

Component Type	Intended Function[a]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

2.3.2 Engineered Safety Features

The engineered safety features (ESF) are described mainly in UFSAR Chapter 6.

The following systems are described in this section.

- Section 2.3.2.1, Safety Injection
- Section 2.3.2.2, Containment Spray
- Section 2.3.2.3, Residual Heat Removal
- Section 2.3.2.4, Containment Penetrations
- Section 2.3.2.5, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2)

2.3.2.1 Safety Injection

System Description

The purpose of the safety injection (SI) system (system code 063) is to provide core cooling and additional shutdown margin following an accident, as a part of the emergency core cooling system (ECCS). The SI system together with the chemical and volume control system (CVCS) and the residual heat removal (RHR) system comprise the ECCS. The ECCS provides core cooling for a spectrum of accident conditions, injecting coolant into the RCS up to full RCS operating pressure. The centrifugal charging pumps of the CVCS provide high pressure injection, the safety injection pumps and cold leg accumulators of the SI system cover an intermediate range of RCS pressures, and the RHR system provides coolant injection at low RCS pressure. Injection water is provided by the refueling water storage tank (RWST) until its inventory is reduced to a low level, at which time injection water is drawn from the containment sump.

Major components of each of the Unit 1 and Unit 2 SI systems include the safety injection pumps, cold leg accumulators, centrifugal charging pump injection tank, refueling water storage tank, and containment sump strainer assembly. The system also includes the piping and valves supporting SI system operation and the piping connections to and from the CVCS and RHR system that support their operation as part of the ECCS. The SI system includes piping and valves in connections from the RWST to the pumps of the CVCS, SI and RHR systems, from the containment sump to the RHR system, from the centrifugal charging pumps of the CVCS through the injection tank to the RCS cold legs, from the SI pumps to the RCS cold legs and hot legs, from the RHR system to the RCS cold legs and hot legs, from the RHR system to the SI pumps and centrifugal charging pumps of the CVCS, and from the accumulators to the RCS cold legs. The SI system also provides piping connections from the RWST and containment sump to the containment spray system.

The safety injection pumps deliver water from the RWST after the RCS pressure is reduced below their shutoff head. A minimum flow bypass line is provided on each pump discharge to recirculate flow to the RWST in the event the pumps are started with the RCS pressure above the pump shutoff head. The safety injection pump oil coolers are cooled by essential raw cooling water (ERCW) and form part of that system's pressure boundary.

The cold leg accumulators are filled with borated water and pressurized with nitrogen gas. Should the RCS pressure fall below the accumulator pressure, borated water is forced into the RCS. One accumulator is attached to each of the cold legs of the RCS.

The injection tank contains normal RCS water and is connected to the discharge of the centrifugal charging pumps. When required for safety injection, the charging pumps provide flow through the tank into the RCS when the isolation valves open.

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

- Provide coolant injection to the RCS as a part of the ECCS to provide core cooling and additional shutdown margin, including the following:
  - Initial injection from the RWST via the SI pumps.
  - Injection from the accumulators to the RCS cold legs.
  - Recirculation to the RCS from the containment sump via the RHR pumps.
- Support the ECCS functions of the CVCS and RHR system, including providing the following:
  - Flow from the RWST to the pumps of the CVCS and RHR system.
  - Flow from centrifugal charging pumps to the RCS cold legs.
  - Flow from the RHR system to the RCS cold legs and hot legs.
  - Suction from the containment sump to the RHR system during recirculation.
  - Flow from the RHR system to the centrifugal charging pumps during recirculation.
- Provide flow from the RWST or the containment sump to the containment spray system.
- Maintain integrity of reactor coolant pressure boundary.
- Support the essential raw cooling water system 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 (safe shutdown) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR References

Section 6.3

Components Subject to Aging Management Review

Class 1 SI system components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. System valves supporting the containment isolation boundary of the waste disposal system high pressure nitrogen supply line to the accumulator tanks are reviewed in Section 2.3.3.13, Waste Disposal. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.2.5, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). The containment sump strainer assembly is evaluated as a structural component in Section 2.4.1, Reactor Building. Remaining SI 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.

<u>License Renewal Drawings</u>

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

LRA-1-47W811-1	LRA-2-47W811-1
LRA-1,2-47W859-4	LRA-1-47W845-6
LRA-2-47W845-4	

**Table 2.3.2-1
Safety Injection System
Components Subject to Aging Management Review**

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

2.3.2.2 Containment Spray

System Description

The purpose of the containment spray (CS) system (system code 072) is to spray cool water into the containment atmosphere following a LOCA to ensure that the containment pressure cannot exceed the containment shell design pressure. The containment spray trains supplement the ice condenser until all the ice is melted after the LOCA, at which time the containment spray and the RHR trains become the sole systems for removing energy directly from the containment.

Upon system activation during a LOCA, adequate containment cooling is provided in sequential modes: (1) spraying a portion of the contents of the RWST into the containment atmosphere using the containment spray trains; (2) after the RWST has reached a low level, recirculation of water from the containment sump through the containment spray trains and back into containment; and (3) diversion of a portion of the recirculation flow from the RHR system through an RHR spray train and back into containment. The latter operation occurs in the event the containment pressure reaches a predetermined value after the ice condenser has been depleted.

The CS system includes two complete CS trains, each of which is independently capable of meeting system requirements. Each train includes a pump, heat exchanger cooled by essential raw cooling water, ring header with nozzles, isolation valves and associated piping, and instrumentation and controls. The CS system also includes two RHR ring headers with nozzles, isolation valves and associated piping, which can be supplied from the RHR system. Piping from the RWST and from the containment sump to the CS pumps is part of the safety injection system.

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

- Mitigate the containment pressure and temperature after a loss of coolant accident or steam line rupture inside containment.
- Support the essential raw cooling water system pressure boundary.
- 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 (isolation to support RHR flow path pressure boundary) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR References

Section 6.2.2

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 2.3.2.5, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining CS 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-1,2-47W812-1

LRA-1,2-47W859-4

LRA-1,2-47W845-2

Table 2.3.2-2
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)	Pressure boundary Heat transfer
Nozzle	Pressure boundary Flow control
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.2.3 Residual Heat Removal

System Description

The purpose of the residual heat removal (RHR) system (system code 074) is to remove heat from the core and reduce the temperature of the reactor coolant system (RCS) during plant cooldown or following a LOCA as part of the ECCS. The heat load handled by the RHR system during the later stages of cooldown, when heat transfer to the steam and power conversion system is less efficient, includes residual and decay heat from the core and reactor coolant pump heat. As part of the ECCS, the RHR system will deliver water from the RWST or the containment sump to the RCS should the RCS pressure fall below RHR pump shutoff head. The RHR system is also used for filling the refueling cavity before refueling and pumping water back to the RWST after refueling operations.

The system consists of two residual heat exchangers, two residual heat removal pumps, and the associated piping, valves, and instrumentation necessary for operational control. Piping connections to the suction of the RHR pumps is provided from the RWST, the containment sump, and the hot leg of reactor coolant loop No. 4. The system return lines are connected to the cold legs of each of the reactor coolant loops through the injection lines of the safety injection system. A return flow path to two of the four hot legs is also provided to prevent boron precipitation. A minimum flow bypass line is provided for the pumps to recirculate through the residual heat exchangers and return the cooled fluid to the pump suction should these pumps be started with their normal flow paths blocked. Piping connections are provided to the CS system to support RHR spray.

During RHR system operation for a normal cooldown, reactor coolant flows from the RCS to the RHR pumps, through the tube side of the residual heat exchangers, and back to the RCS. The heat is transferred to the component cooling water circulating through the shell side of the residual heat exchangers.

Following a LOCA, the RHR pumps would take suction from the RWST and deliver borated water to the four RCS cold legs. These pumps begin to deliver water to the RCS only after the pressure has fallen below the pump shutoff head. The RHR system is designed such that there are four injection legs for ECCS operation. The injection mode continues until the RWST inventory is depleted and RHR pumps have been realigned to take suction from the containment sump in the recirculation mode.

In the recirculation mode of core cooling, water collected in the containment sump is cooled by the RHR heat exchangers and returned to the RCS. The RCS can be supplied simultaneously from the RHR pumps and from the charging pumps and safety injection pumps using a portion of the flow from the outlet of the residual heat exchangers. The charging and safety injection pumps return the water to the RCS. This mode of operation assures flow in the event of a small rupture where the depressurization proceeds more slowly such that the RCS pressure is still in excess of the shutoff head of the residual heat removal pumps at the onset of recirculation.

In the event of extreme site flooding when one or both reactor vessels are open, the spent fuel pit cooling system will be connected to the residual heat removal system with normally disconnected spool pieces. Using this connection, the spent fuel pit cooling system flow will be directed to the RHR system heat exchanger bypass line for core cooling, returning to the spent fuel pool by way of the refueling canal and fuel transfer tubes.

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

- Provide low pressure injection to the RCS as a part of the ECCS to provide core cooling and additional shutdown margin, including initial injection from the RWST and recirculation of the RCS from the containment sump.
- Provide suction from the containment sump to the safety injection and centrifugal charging pumps during cold leg and hot leg recirculation.
- Transfer decay heat from the RCS to the component cooling system during cooldown and shutdown operations.
- Provide for hot leg recirculation.
- Support RHR spray flow through the containment spray system.
- Support core cooling by the spent fuel pit cooling system during extreme flooding with either vessel open for refueling.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

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

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

UFSAR References

Section 5.5.7

Section 6.3

Section 2.4A

Components Subject to Aging Management Review

ASME Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.2.5, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining RHR 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-1,2-47W810-1

LRA-1,2-47W859-4

Table 2.3.2-3
Residual Heat Removal System
Components Subject to Aging Management Review

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

2.3.2.4 Containment Penetrations

The primary and secondary containments 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.

Following the description of primary and secondary containment, descriptions are provided or referenced for systems that support integrity of the penetrations.

Primary Containment System Design

As described in UFSAR Section 6.2.1, the primary containment consists of a containment vessel and a separate reactor shield building enclosing the containment vessel and annulus. The containment vessel is a freestanding, welded steel structure with a vertical cylinder, hemispherical dome, and a flat circular base that provides primary containment. The reactor shield building is a reinforced concrete structure similar in shape to the containment vessel that protects the containment vessel from external events.

Secondary Containment System Design

Two secondary containment barriers are provided at SQN. One of these is formed by the reactor shield building that surrounds the steel primary containment vessel. The other secondary containment barrier is the auxiliary building secondary containment enclosure (ABSCE), which is the auxiliary building structure that encloses all equipment in the building that may handle, collect or store radioactive materials during normal operation or accidents.

The principal components that function collectively to form a secondary containment barrier around the steel primary containment vessel are the shield building itself, the shield building penetration seals, the isolation valves installed in the penetrations to the shield building, and the shield building penetration leakoff facilities. The principal components that collectively form the ABSCE are the auxiliary building itself, penetration seals, airlocks, isolation dampers for auxiliary building ventilation supply and exhaust ducts, and other design features that prevent leakage across the barrier.

The auxiliary boiler system originally supplied steam to components in the auxiliary building, but most of the system has been abandoned (see Section 2.3.3.17 for system description). The steam supply line at the turbine building to auxiliary building penetration has been isolated by blind flanges. The nonsafety-related blind flange and piping inside the auxiliary building forms part of the ABSCE and is included in this review.

System Description

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

- Support containment pressure boundary.

The auxiliary boiler system (system code 12) has the following intended function for 10 CFR 54.4(a)(2) included in this review of containment penetrations.

- Support containment pressure boundary.

The systems described below have no other system intended functions. Systems referenced below but described elsewhere have additional intended functions included in other aging management reviews as referenced.

System Test Facility (Instrumentation)

The purpose of the system test facility system (system code 052) is to support miscellaneous system monitoring and testing functions including loose parts monitoring, reactor coolant pump vibration monitoring, seismic monitoring, and containment leak rate testing. The system is primarily an instrumentation system using electrical components, but the system includes a small number of mechanical components supporting the containment leak rate testing function. These include containment isolation valves.

UFSAR References: Section 3.7.4, Section 7.6.5

Containment Isolation

The purpose of the containment isolation system (system code 088) is to isolate fluid systems that pass through containment penetrations to confine any radioactivity that may be released in the containment following an accident. Containment isolation is provided by components of the fluid systems that penetrate containment. The containment isolation system code includes containment design features that support isolation but are not part of other system codes. Most of these features, such as personnel air locks and equipment hatches, are evaluated as structural components. The system also includes shutdown maintenance access penetrations that are isolated by blank flanges during normal operation. These penetrations and blank flanges are evaluated as mechanical components.

UFSAR References: Section 6.2.4 discusses containment isolation.

Penetration and Sleeves

The purpose of the penetrations and sleeves system (system code 302) is to provide equipment used for mechanical and electrical containment penetrations. The majority of the system components are penetrations and sleeves that provide physical support to the mechanical or electrical system components passing through the penetration. These penetrations and sleeves and other penetration support equipment are evaluated as structural components.

The system includes a small number of miscellaneous valves and piping components supporting the penetrations. Some of these mechanical components support the containment pressure boundary.

UFSAR References: Section 6.2

Other Miscellaneous Systems Described Elsewhere in the Application.

The following additional systems have containment penetrations included in this review of containment penetrations.

System Code	System Name	Section Describing System
012	Auxiliary Boiler	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
030	Containment Vacuum Relief Reactor Building Purge	Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems
033	Service Air	Section 2.3.3.7, Compressed Air
059	Demineralized Water and Cask Decon	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
061	Ice Condenser	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
081	Primary Water Makeup	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
090	Radiation Monitoring	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

UFSAR References

Section 6.2	*Containment Isolation System*
System Test Facility System	Section 6.2.4
Section 3.7.4	*Penetrations and Sleeves*
Section 7.6.5	Section 6.2

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 (including spare penetrations). 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 2.3.2-4 lists the component types that require aging management review.

Table 3.2.2-4 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-1-47W811-2	LRA-1,2-47W819-1
LRA-2-47W811-2	LRA-1,2-47W846-2
LRA-1,2-47W814-2	LRA-1,2-47W856-1
LRA-1,2-47W815-2	LRA-2-47W866-1

Table 2.3.2-4
Containment Penetrations
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

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

System Description

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 SQN, 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 oil, steam or liquid 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.

- Safety injection (Section 2.3.2.1)
- Containment spray (Section 2.3.2.2)
- Residual heat removal (Section 2.3.2.3)

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.

UFSAR References

For UFSAR 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 base-mounted component, flexible connection, or the end of a piping run (such as a vent or drain line).

(4) A boundary supported by design documents, such as piping stress analyses.

(5) A point where buried piping exits the ground.

For spatial interaction, ESF system components containing oil, steam, or liquid 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 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.

Series 2.3.2-5-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 3.2.2-5-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
063	Safety Injection	Table 2.3.2-5-1	Table 3.2.2-5-1
072	Containment Spray	Table 2.3.2-5-2	Table 3.2.2-5-2
074	Residual Heat Removal	Table 2.3.2-5-3	Table 3.2.2-5-3

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	
063	Safety Injection	LRA-1-47W811-1	LRA-2-47W811-1
072	Containment Spray	LRA-1,2-47W812-1	
074	Residual Heat Removal	LRA-1,2-47W810-1	

Table 2.3.2-5-1
Safety Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Filter housing	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

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

Table 2.3.2-5-2
Containment Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flex connection	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary

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

Table 2.3.2-5-3
Residual Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

2.3.3 Auxiliary Systems

The following systems are described in this section.

- Section 2.3.3.1, Fuel Oil
- Section 2.3.3.2, High Pressure Fire Protection
- Section 2.3.3.3, Fire Protection CO_2 and RCP Oil Collection
- Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems
- Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems
- Section 2.3.3.6, Control Building HVAC
- Section 2.3.3.7, Compressed Air
- Section 2.3.3.8, Station Drainage
- Section 2.3.3.9, Sampling and Water Quality
- Section 2.3.3.10, Chemical and Volume Control
- Section 2.3.3.11, Essential Raw Cooling Water
- Section 2.3.3.12, Component Cooling
- Section 2.3.3.13, Waste Disposal
- Section 2.3.3.14, Spent Fuel Pit Cooling
- Section 2.3.3.15, Standby Diesel Generator
- Section 2.3.3.16, Flood Mode Boration Makeup
- Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

2.3.3.1 Fuel Oil

System Description

The purpose of the fuel oil system (system code 018) is to provide fuel oil for the diesel generators and auxiliary boilers. The system includes fuel oil storage tanks and transfer equipment to supply the standby diesel generators, the high pressure fire protection diesel engine, and the backup security diesel generator. The system also includes the piping, valves and connections to supply fuel oil from a temporary fuel oil tanker.

The safety-related portion of the fuel oil system supporting the standby diesel generators includes four embedded seven-day storage tank assemblies (one for each diesel generator unit) and associated pumps, valves, and piping. The tanks are embedded in the diesel generator building substructure. Two engine-mounted, motor-driven pumps are provided for each diesel generator unit to transfer fuel from the embedded storage tank assemblies to the two engine-mounted day tanks for each diesel generator unit. Each of these pumps is capable of supplying fuel to both day tanks. Although not required to support the safety function of the diesels, each of the embedded seven-day storage tank assemblies can be supplied by either of two nonsafety-related 70,000 gallon storage tanks or from a tank truck.

The high pressure fire protection diesel engine is supplied from a storage tank in the high pressure fire protection pump house. This tank is filled from a connection independent from the rest of the system.

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

- Provide fuel oil for the operation of the standby diesel generators.

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

- Perform a function (provide fuel oil for the high pressure fire protection diesel fire pump and standby diesel generators) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR References

Section 9.5.4

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 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining fuel oil 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 drawing.

LRA-1,2-47W840-1

Table 2.3.3-1
Fuel Oil System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flame arrestor	Flow control
Flex connection	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.2 High Pressure Fire Protection

System Description

The purpose of the high pressure fire protection (HPFP) system (system code 026) is to provide a source of water for fire suppression around the site. The system includes the system water supply tanks and pumps, fire water distribution piping, valves, sprinklers, hydrants, hose stations, instruments and controls, and fire extinguishers used for fire suppression throughout the plant. The HPFP system is also connected to two fire/flood mode pumps (old fire pumps), which can be used by opening the normally closed valves which isolate them from the system.

The system water supply is common to both units and consists of an electric fire pump and a diesel fire pump. Each pump can take suction from either of two 300,000-gallon potable water storage tanks (pumps are normally aligned to their own associated tanks) which are supplied by the local municipal utility. The electric pump is the lead pump and the diesel pump is a backup. Each pump is connected to the HPFP system looped yard main which supplies the site fire water distribution system. The HPFP system is normally pressurized by a cross-connect to the fire tank potable water supply and two jockey pumps that automatically start if the potable water supply cannot maintain system header pressure. The fire pumps automatically start on low HPFP system header pressure. The fire water distribution system supplies yard hydrants, interior manual hose installations, manually actuated fixed water suppression systems, and automatic suppression systems throughout the plant. Portable fire extinguishers of a size and type compatible with specific hazards are located throughout the plant and are included in the HPFP system code.

The HPFP system supplies fire suppression equipment inside containment. System components support the containment pressure boundary.

Two safety-related stand-by pumps in the fire protection system (fire/flood mode pumps) are for use during the flood mode condition to assure a long-term source of water to remove RCS and spent fuel pit (SFP) decay heat. These pumps take suction from the forebay and are normally isolated from the HPFP system by closed valves. In the event of a natural flood above plant grade, the auxiliary feed water system for each unit can be connected to the common fire protection looped header through a spool piece connection and used to feed the steam generators. Decay heat can be removed by steam relief through the main steam power operated relief valves. Water can be added to the SFP from the HPFP system using fire hoses located in the SFP area, with SFP decay heat removed via steam exhausted through the area ventilation system.

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

- Support RCS and SFP decay heat removal in the event of a natural flood above plant grade.

- Support containment pressure boundary.

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

- Support RCS and spent fuel pit decay heat removal in the event of a natural flood above plant grade.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

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

- Perform functions that demonstrate compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR References

Appendix 2.4A

Section 9.5.1

Components Subject to Aging Management Review

The HPFP system code contains the reactor coolant pump oil collection system. Components that support this function are reviewed in Section 2.3.3.3, Fire Protection CO_2 and RCP Oil Collection.

Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining HPFP 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-1,2-47W803-2	LRA-1,2-47W850-7	LRA-1,2-47W850-21
LRA-1,2-47W850-1	LRA-1,2-47W850-8	LRA-1,2-47W850-24
LRA-1,2-47W850-2	LRA-1,2-47W850-9	LRA-1,2-47W850-25
LRA-1,2-47W850-3	LRA-1,2-47W850-10	LRA-1,2-47W850-26
LRA-1,2-47W850-4	LRA-1,2-47W850-11	LRA-1,2-47W850-27
LRA-1,2-47W850-5	LRA-1,2-47W850-12	LRA-1,2-47W860-1
LRA-1,2-47W850-6	LRA-1,2-47W850-20	

Table 2.3.3-2
High Pressure Fire Protection System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Flow element	Pressure boundary Flow control
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Heater housing	Pressure boundary
Muffler	Pressure boundary
Nozzle	Pressure boundary Flow control
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Retard chamber	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vortex breaker	Flow control

2.3.3.3 Fire Protection CO_2 and RCP Oil Collection

System Description

Only the carbon dioxide (CO_2) used for fire protection has an intended function for license renewal. For completeness of the scoping description, the carbon dioxide used for purging is also described below.

The purpose of the CO_2 fire protection and purging system (system code 039) is to provide carbon dioxide for fire suppression and for purging of the main generator. The system includes two CO_2 storage units and related equipment, piping and valves to the main generator for purging and the distribution piping, valves, nozzles, instruments and controls for the fire suppression systems.

Automatic total flooding CO_2 suppression systems are provided for the auxiliary instrument rooms and computer room in the control building and the lube oil storage room, each diesel engine room, fuel oil transfer room, and each 480-V board room in the diesel generator building. Actuation of the CO_2 system causes selective closure of dampers and doors to the area protected.

CO_2 is used to purge air from the main generator before the addition of hydrogen during a plant startup. On plant shutdown, CO_2 is used to purge hydrogen from the generator before opening it to the atmosphere.

CO_2 for the control building and main generator is supplied from a storage tank in an underground vault in the yard. CO_2 for the diesel generator building is stored in a tank in the diesel generator building.

In conformance with 10 CFR 50 Appendix R Section III.0, the reactor coolant pumps (RCPs) are equipped with an oil collecting system. The oil collection system is capable of collecting lube oil from potential pressurized and unpressurized leakage sites in the reactor coolant pump lube oil system. The oil leakage is collected and drained to the vented closed sumps. The collection system consists of drain piping located between the oil collection basins (access platforms around the pumps) and the auxiliary containment sumps. Components supporting this function are part of system code 026 (HPFP) but are included in this review.

The CO_2 purging system has no intended functions for 10 CFR 54.4(a)(1), (a)(2), or (a)(3).

The fire protection CO_2 and the RCP oil collection systems have no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The fire protection CO_2 and RCP oil collection systems have 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).

UFSAR References

None

Components Subject to Aging Management Review

Fire protection CO_2 and RCP oil collection 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-1,2-47W843-1

LRA-1,2-47W843-2

LRA-1,2-47W851-1

Table 2.3.3-3
Fire Protection CO_2 and RCP Oil Collection Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Nozzle	Pressure boundary Flow control
Odorizer	Pressure boundary
Piping	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.4 Miscellaneous Heating, Ventilating and Air Conditioning Systems

System Description

The purpose of the heating, ventilating and air conditioning (HVAC) systems (system codes 030, 031, 044, 300, 311, 312, 313, 440) is to maintain suitable temperature and humidity conditions within plant buildings for the operation of equipment and the comfort and safety of plant personnel during normal and accident conditions. The HVAC systems also support post-accident containment heat removal, air purification, and air cleanup to maintain off-site dose rates within limits; however, HVAC systems performing these functions are not evaluated in this review of miscellaneous HVAC systems and those intended functions are not listed below. See Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems, and Section 2.3.3.6, Control Building HVAC, for further information on HVAC systems performing these functions.

Components of the auxiliary building ventilation, diesel generator building ventilation, high pressure fire protection pump house, and ERCW facility ventilation are evaluated in this review of miscellaneous HVAC systems. With the exception of ventilation systems reviewed in Section 2.3.3.5 and Section 2.3.3.6, the ventilation systems for other buildings around the site have no intended functions within the scope of license renewal.

Components from the system codes listed above are arranged in subsystems to perform various functions. Subsystems included in this review are described below. Where needed for clarification in the following descriptions, references are given to license renewal drawings and component numbers.

Auxiliary Building Ventilation

The purpose of the auxiliary building ventilating systems is to maintain temperature and humidity conditions suitable for equipment operation and personnel access in the auxiliary building, including the radwaste areas and the fuel handling area. Separate subsystems are used for the environmental control of the shutdown board rooms, auxiliary board rooms, and other miscellaneous rooms and laboratories. The ventilating systems also incorporate individual cubicle coolers to provide supplementary cooling to specific safety feature equipment. The auxiliary building ventilating systems (primarily system codes 030, 031 and code 313, which is synonymous with 31C) consist of the following subsystems:

- Building air supply and exhaust system (general ventilation)
- Building cooling system (chilled water)
- Safety feature equipment coolers
- Shutdown board room air-conditioning system
- Auxiliary board room air-conditioning system

- Shutdown transformer room ventilation system
- Miscellaneous ventilation and air-conditioning systems

Building Air Supply and Exhaust System (General Ventilation);
Building Cooling System (Chilled Water)

The building air supply and exhaust system is nonsafety-related except as necessary to support auxiliary building isolation and auxiliary building gas treatment system (ABGTS) operation. Components that support this intended function are reviewed in Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems.

In the event of a natural flood above plant grade, decay heat from fuel in the spent fuel pit (SFP) can be removed by boiloff of SFP water with the steam exhausted by the exhaust fans for the fuel handling. This is a system intended function meeting the criterion of 10 CFR 54.4(a)(2). Components that support this intended function are reviewed in Section 2.3.3.5.

The nonsafety-related auxiliary building cooling system supplements the general ventilation system and maintains a more comfortable temperature in auxiliary building general spaces. The building cooling system consists of two packaged water chillers, two primary loop circulating pumps, two secondary loop circulating pumps, six fan-coil type air handling units, and associated piping, duct work and controls. The system has no intended functions for 10 CFR 54.4(a)(1) or (a)(3). For HVAC system functions that meet the physical interaction criteria of 10 CFR 54.4(a)(2), see Section 2.3.3.17.

Safety Feature Equipment Coolers

Safety feature equipment coolers maintain suitable temperatures for equipment operation when required. Cubicles or areas containing engineered safety feature equipment are ventilated by the nonsafety-related auxiliary building ventilation exhaust system during normal plant operation or when the equipment is not required to operate. Safety-related air cooling units, located in each cubicle or area, will automatically start to provide necessary cooling, depending on its specific logic, whenever an auxiliary building isolation occurs, when the safety feature equipment is operated, or when the room temperature exceeds the thermostat setpoint.

The cooling units are cooled by ERCW and provide cooling to the cubicle areas for the RHR pumps, safety injection pumps, containment spray pumps, Unit 1 auxiliary feedwater and component cooling pumps, Unit 2 auxiliary feedwater and boric acid transfer pumps, emergency gas treatment room, pipe chases, component cooling booster and spent fuel pit pumps, centrifugal charging pumps, and penetration rooms at El. 669, 690, 714, and 734 (see LRA Drawing LRA-1,2-47W866-8).

Shutdown Board Room Air-Conditioning System

The safety-related shutdown board room air-conditioning system maintains environmental control for the shutdown board rooms and auxiliary control room (see LRA Drawing LRA-1,2-47W866-3). The 480V shutdown board rooms (rooms 1A1, 1A2, 1B1, 1B2, 2A1, 2A2, 2B1, 2B2) and 6.9KV shutdown board rooms (rooms A and B) and auxiliary control room support the safe shutdown of both plant units following an accident in either unit, from outside the main control room (alternate shutdown).

Each of the four shutdown board room air conditioning units can provide the necessary cooling required by the auxiliary control room. There are two trains, each consisting of two air handling units (AHU) (1A-A and 1B-B [AHUs 323 and 358], 2A-A and 2B-B [AHUs 332 and 367]) supplied by a chiller package with a chilled water circulating pump (see LRA Drawing LRA-1,2-47W865-8).

Pressurizing supply fans pressurize the shutdown board rooms and auxiliary control room with filtered air to prevent infiltration of contaminated plant air from adjacent areas except during control room isolation (see LRA Drawing LRA-1,2-47W866-3 [fans 383, 384, 391 and 392]).

The system also supplies the four battery board rooms (I, II, III, and IV) and the two auxiliary control instrument rooms per unit (1A and 1B, 2A and 2B) (see LRA Drawing LRA-1,2-47W866-3).

Auxiliary Board Room Air-Conditioning System

The safety-related auxiliary board room air-conditioning system maintains environmental control for the auxiliary board rooms (also called the 480V board rooms or 480V electrical board rooms) and battery rooms I, II, III, and IV. The auxiliary board rooms also support alternate shutdown of both plant units.

Four separate air-conditioning systems are provided. Each auxiliary board room air-conditioning system contains the following (LRA drawings referenced):

- A refrigerant compressor (LRA-1,2-47W865-6).
- An air-cooled condenser (LRA-1,2-47W865-6 and LRA-1,2-47W866-3 [ACCs 428, 453, 478 and 503]).
- A fan-coil air handling unit with direct-expansion cooling coil(s) (LRA-1,2-47W865-6 and LRA-1,2-47W866-3-1 [AHUs 438, 464, 488, and 514]).
- Two pressurizing supply fans (LRA-1,2-47W866-3 [fans 425, 426, 450, 451, 475, 476, 500, 501]).
- Air supply distribution system.
- Control and safety devices.

The pressurizing supply fans replace a portion of air-conditioning system air exhausted through the battery room and pressurize the board rooms to prevent infiltration of contaminated plant air from adjacent areas.

Two safety-related roof ventilator exhaust fans located on the roof of each of the four separate battery rooms I, II, III and IV provide continuous ventilation to prevent the possible accumulation of hydrogen gas (see LRA Drawing LRA-1,2-47W866-3).

The fifth vital battery room is ventilated separately, using safety-related components: two supply fans, two supply air filters, two exhaust fans and associated dampers (see LRA Drawing LRA-1,2-47W866-3).

Shutdown Transformer Room Ventilation System

The shutdown transformer room ventilation system provides ventilation for the four shutdown transformer rooms (480V Transformer Rooms 1A, 1B, 2A and 2B on LRA Drawing LRA-1,2-47W866-3). The system includes for each transformer room two air intake structures and three safety-related exhaust fans. Rooms 1A and 2B each have a fourth (nonsafety-related) exhaust fan.

Miscellaneous Ventilation and Air-Conditioning Systems

The miscellaneous ventilation and air-conditioning systems include nonsafety-related ventilation for the control rod drive equipment rooms, instrument shop, hot instrument shop, sample room, waste gas analyzer room, and reactor building steam valve vault rooms. Ventilation for these areas uses air-conditioning units, exhaust fans, lab hoods with exhaust fans, and high-efficiency particulate air (HEPA) filters as appropriate. These systems do not perform any intended functions for 10 CFR 54.4(a)(1) or (a)(3). Miscellaneous HVAC system functions that meet the physical interaction criteria of 10 CFR 54.4(a)(2) are reviewed in Section 2.3.3.17.

The miscellaneous ventilation and air-conditioning systems also include two roof ventilator type exhaust fans, one AC driven and one direct-current (DC) driven, on the roof of each turbine-driven auxiliary feedwater (TDAFW) pump room. The DC-driven fan is safety-related and is capable of cooling the room to support TDAFW pump operation during a station blackout. The TDAFW pump rooms are normally ventilated by the nonsafety-related auxiliary building air exhaust system. (See LRA Drawings LRA-1,2-47W866-2, LRA-1,2-47W866-11.)

The auxiliary building ventilation system has the following intended functions for 10 CFR 54.4(a)(1) included in this review of miscellaneous HVAC.

- Maintain an acceptable environment for the operation of safety-related electrical and mechanical equipment.
- Maintain acceptable hydrogen concentrations in battery rooms.
- Support the essential raw cooling water system pressure boundary.

The auxiliary building ventilation system has the following intended function for 10 CFR 54.4(a)(2) included in this review of miscellaneous HVAC.

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

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

- Perform a function (fire barriers [dampers], ventilation for safe shutdown equipment and alternate shutdown) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).
- Perform a function (turbine-driven auxiliary feedwater pump room cooling) that demonstrates compliance with the Commission's regulations for station blackout (10 CFR 50.63).

Diesel Generator Building Ventilation

The purpose of the diesel generator building ventilating systems is to maintain an acceptable building environment for the protection and operation of the diesel generators, electrical boards, and equipment and for the safety of operating personnel.

The diesel generator building ventilating system (primarily system code 030 and code 300) includes safety-related and nonsafety-related ventilation components.

Safety-related fans, duct and dampers maintain the diesel generator rooms and the electrical board rooms. Two diesel generator room exhaust fans and one electrical board room exhaust fan are located in the fan room for each of the four diesel generator units. These exhaust fans discharge to the outdoors. A roof-mounted air intake admits outdoor air to each electrical board room, and a fresh-air intake hood on the building provides outside air to the diesel generator rooms. One generator and electrical panel ventilation fan is provided within each diesel room at the air supply opening to the room to deliver cooling air to the generator air intake and to the interior of the generator's electrical control panel.

Nonsafety-related diesel generator building exhaust fans provide ventilation for the lubricating oil storage room, fuel oil transfer room, CO_2 storage room, toilet room, radiation shelter room, and muffler rooms.

The diesel generator building ventilating system has the following intended function for 10 CFR 54.4(a)(1).

- Maintain an acceptable environment for the operation of safety-related electrical and mechanical equipment in the diesel generator building.

The diesel generator building ventilating 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 diesel generator building ventilating system has the following intended function for 10 CFR 54.4(a)(3).

- Perform a function (fire barriers [dampers] and ventilation for safe shutdown equipment) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

High Pressure Fire Protection Pump House

The ventilation equipment in the HPFP pump house (included in system code 030) supports the operation of the HPFP pumps. The system includes two roof-mounted exhaust fans (one per pump room) and air intake louvers in the walls.

The ventilation equipment in the HPFP pump house has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The ventilation equipment in the HPFP pump house 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).

ERCW Facility Ventilation

The purpose of the ERCW facility ventilation system is to maintain suitable conditions within the facility for the operation of equipment and the comfort and safety of plant personnel during normal operation. The system (included in system code 30) includes three nonsafety-related supply fans, supply air distribution ducts and dampers, three sets of unit heaters, and three air relief vents. The system is used to maintain appropriate conditions during normal operations and to support safety-related equipment operation following an accident.

The ERCW facility ventilation system has no intended functions for 10 CFR 54.4(a)(1).

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

- Maintain an acceptable environment for the operation of safety-related electrical and mechanical equipment in the ERCW facility.

The ERCW facility ventilation system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 9.4

Components Subject to Aging Management Review

Nonsafety-related components of miscellaneous HVAC systems not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining miscellaneous HVAC 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.

Auxiliary Building Ventilation

- LRA-1,2-47W865-6
- LRA-1,2-47W865-8
- LRA-1,2-47W866-2
- LRA-1,2-47W866-3
- LRA-1,2-47W866-3-1
- LRA-1,2-47W866-4
- LRA-1,2-47W866-8
- LRA-1,2-47W866-10
- LRA-1,2-47W866-11
- LRA-1,2-47W845-2
- LRA-1-47W845-6

Diesel Generator Building Ventilation

- LRA-1,2-47W866-9

High Pressure Fire Protection Pump House

- LRA-1,2-47W866-13

ERCW Facility Ventilation

- LRA-1,2-47W866-21

Table 2.3.3-4
Miscellaneous Heating, Ventilation and Air Conditioning Systems
Components Subject to Aging Management Review

Component Type	Intended Function
AHU housing	Pressure boundary
Bolting	Pressure boundary
Condenser housing	Pressure boundary
Cooler housing	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Flex connection	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)	Pressure boundary Heat transfer
Heater housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator housing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary

**Table 2.3.3-4 (Continued)
Miscellaneous Heating, Ventilation and Air Conditioning Systems
Components Subject to Aging Management Review**

Component Type	Intended Function
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.5 Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems

<u>System Description</u>

The purpose of the HVAC systems (system codes 030, 031, 044, 300, 311, 312, 313, 440) is to maintain suitable temperature and humidity conditions within plant buildings for the operation of equipment and the comfort and safety of plant personnel during normal and accident conditions. The HVAC systems also support post-accident containment heat removal, air purification and air cleanup to maintain off-site dose rates within limits.

Components in the air return fan system, auxiliary building gas treatment system, auxiliary building ventilation systems, containment air cooling systems, containment vacuum relief system, post-accident sampling ventilation system, reactor building purge system, and emergency gas treatment system (system code 065) are evaluated in this review. For other HVAC systems, see Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems, and Section 2.3.3.6, Control Building HVAC.

<u>Air Return Fans</u>

The purpose of the air return fan system is to enhance the ice condenser and containment spray heat removal operation following an accident by circulating air from the upper compartment to the lower compartment, through the ice condenser, and then back to the upper compartment. The system (included in system code 030) also limits hydrogen concentration in potentially stagnant regions by ensuring a flow of air from these regions. (See LRA Drawings LRA-1-47W866-1 and LRA-2-47W866-1.)

Two air return fans remove air from the upper compartment through a main duct to an accumulator room of the lower compartment. The discharged air will flow from each accumulator room through the annular equipment areas into the lower compartment. Any steam produced by residual heat will mix with the air and flow through the lower inlet doors of the ice condenser. The steam portion of the mixture will condense as long as ice remains in the ice condenser and the air will continue to flow into the upper compartment through doors at the top of the ice condenser. Each main duct contains a non-return damper which prevents excessive reverse flow.

The air return fan system provides post-LOCA hydrogen mixing by drawing air from the containment dome, steam generator enclosures, pressurizer enclosure, upper reactor cavity, accumulator rooms, and the instrument room. Hydrogen collection headers from these areas are routed to the suction side of either of the two air return fans.

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

- Return air from the upper compartment to the lower compartment of containment to reduce containment pressure after a design basis accident LOCA or main steam line break inside containment and prevent excessive hydrogen concentrations in pocketed areas of containment.

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

Auxiliary Building Gas Treatment

The purpose of the auxiliary building gas treatment system (ABGTS) is to reduce radioactive nuclide releases from the auxiliary building secondary containment enclosures (ABSCE) following accidents. When initiated, this system draws air from various parts of the auxiliary building to establish a negative pressure in the auxiliary building with respect to outside atmosphere. Air is directed to air cleanup equipment before being discharged through the shield building vent. (See LRA Drawing LRA-1,2-47W866-10.)

This system (primarily system code 030 and code 313, which is synonymous with 31C) consists of two parallel duct installations originating from exhaust ducting that normally serves various areas in the auxiliary building. Each of these ducts leads directly to an air cleanup unit, to the fan associated with the air cleanup unit, and then directly to the shield building vent. The air cleanup units are equipped with a prefilter bank, HEPA filter bank, and carbon adsorber bank.

The air flow network that is not unique to this system consists of most of the normal ventilation ducting installed in the ABSCE. When the secondary containment enclosure is isolated, this duct network provides a flow path for reducing the air pressure level in all parts of this enclosure.

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

- Maintain the ABSCE air volume below atmospheric pressure and reduce radioactive nuclide releases from the ABSCE during accidents by routing all exhaust air through an air cleanup unit prior to release to the atmosphere.

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

Auxiliary Building Ventilation

The purpose of the auxiliary building ventilating systems is to maintain temperature and humidity conditions suitable for equipment operation and personnel access in the auxiliary building, including the radwaste areas and the fuel handling area. Separate subsystems are used for the environmental control of the shutdown board rooms, auxiliary board rooms, and other miscellaneous rooms and laboratories. The ventilating systems also incorporate individual cubicle coolers to provide supplementary cooling to specific safety feature equipment.

The auxiliary building ventilating systems (primarily system codes 030, 031 and code 313, which is synonymous with 31C) consist of several subsystems. Only the building air supply and exhaust system (general ventilation) is included in this review (see LRA Drawings LRA-1,2-47W866-10, LRA-1,2-47W866-11, and LRA-1,2-47W866-2). For the other auxiliary building ventilation systems, see Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems.

The building air supply and exhaust system is nonsafety-related except as necessary to support auxiliary building isolation and ABGTS operation. The supply system filters outdoor air through a bank of filters for each of two mechanical equipment rooms located at opposite ends of the auxiliary building. The air supply system uses four half-capacity supply fans with two located in each of the two mechanical equipment rooms. During normal operation, one fan in each equipment room is in operation with the other fan in the standby mode. Supply air is ducted to various clean or accessible areas of the auxiliary building and fuel handling areas and then flows to areas of progressively greater contamination potential before being exhausted through the building exhaust fans.

The general exhaust from the auxiliary building is provided by exhaust fans that discharge into the auxiliary building exhaust vent. Air from the fuel handling area, waste packaging area, Unit 1 ESF pump rooms, and cask shipping area is exhausted by the fuel handling area exhaust fans. Inlet dampers, furnished with each auxiliary building exhaust and fuel handling area exhaust fan, are used to regulate the volume of air exhausted as required to maintain a negative pressure within the building. When necessary, the exhaust may be routed through pre-filters and HEPA filters prior to discharge through the auxiliary building exhaust stack. In the event of a natural flood above plant grade, decay heat from fuel in the spent fuel pit (SFP) can be removed by boiloff of SFP water with the steam exhausted by the fuel handling area exhaust fans to provide area accessibility to the spent fuel pool area and the auxiliary charging system. Makeup water can be added to the SFP from the HPFP system.

When required to support ABGTS operation, the auxiliary building supply and exhaust fans and the fuel handling exhaust fans are automatically stopped. Low-leakage dampers located in the ducts that penetrate the auxiliary building are closed to form an isolation barrier between the building and the outdoor environment (the auxiliary building secondary containment envelope).

The auxiliary building ventilation system has the following intended functions for 10 CFR 54.4(a)(1) included in this review.

- Support the essential raw cooling water system pressure boundary.
- Support ABGTS operation and auxiliary building isolation.

The auxiliary building ventilation system has the following intended function for 10 CFR 54.4(a)(2) included in this review.

- Support spent fuel pit decay heat removal in the event of a natural flood above plant grade.

The auxiliary building ventilation system has the following intended function for 10 CFR 54.4(a)(3) included in this review.

- Perform a function (fire barriers [isolation dampers] for safe shutdown equipment and alternate shutdown) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

Other intended functions for the auxiliary building ventilating system are included in Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems.

Containment Air Cooling

The purpose of the containment air cooling systems is to maintain acceptable temperatures within the reactor building upper and lower compartments, reactor well, control rod drive mechanism (CRDM) shroud, and instrument room for the protection of equipment and controls during normal reactor operation and normal shutdown. The instrument room is also cooled to permit personnel access during normal reactor operation. (See LRA Drawings LRA-1-47W866-1 and LRA-2-47W866-1.)

The containment air cooling systems (primarily system code 030 and code 313, which is synonymous with 31C) consist of the following subsystems:

- Lower compartment air cooling.
- CRDM air cooling.
- Upper compartment air cooling.
- Reactor building instrument room air cooling.

The lower compartment air cooling system, together with operation of the CRDM air cooling system, supplies air to maintain acceptable air temperature in various lower compartment spaces during normal reactor operation. The system includes four safety-related lower compartment air cooling fan-coil assemblies, distribution ducts, and dampers. The fan-coil assemblies, located in annular concrete chambers around the periphery of the lower compartment, consist of a plenum, air cooling coils, vane-axial fan, instruments, and controls. Lower compartment air passes directly to each active fan-coil assembly where it is cooled and supplied through a common duct distribution system to the lower compartment spaces. Two of the four lower compartment coolers are required to operate following a HELB inside containment that is not a LOCA.

The CRDM air cooling system, in conjunction with the lower compartment air cooling system, maintains the CRDM internals within their design temperatures during normal reactor operation. The CRDM air cooling system consists of four fan-coil assemblies combined into two subsystems. Each assembly consists of a plenum, air cooling coils, vane-axial fan, assembly isolating damper, instruments, and controls. Air drawn through the CRDM shroud is cooled by the active fan-coil assemblies and discharged into the lower compartment. If additional cooling in the lower compartment is required, the CRDM fan-coil assemblies can recirculate and cool an additional portion of the lower compartment air.

The upper compartment air cooling system recirculates and cools a portion of the upper compartment air as needed to maintain acceptable upper compartment temperatures during normal reactor operation. Four fan-coil assemblies are installed on Unit 2 and two fan-coil assemblies are installed on Unit 1. The fan-coil assemblies are located within the upper compartment on top of the steam generator enclosures. Each fan-coil assembly consists of a plenum, air cooling coils, vane-axial fan, instruments, and controls.

The reactor building instrument room is cooled during normal reactor operation or shutdown by either of two air-conditioning systems. Each system consists of a fan-coil unit located within the instrument room, a water-chilling condensing unit and chilled water pump located in the auxiliary building, and the connecting chilled water piping, including containment penetration valves.

The ERCW system functions as the heat sink for each lower compartment, upper compartment, and CRDM air cooling fan-coil assembly and for each instrument room air cooling system condensing unit.

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

- Provide adequate cooling to the lower compartment during post-accident recovery periods.
- Support ERCW system pressure boundary.
- Support containment pressure boundary.

The containment air cooling 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 containment air cooling system has no intended functions for 10 CFR 54.4(a)(3).

Containment Vacuum Relief

The purpose of the containment vacuum relief system is to protect the vessel from an excessive external force. The system limits external pressure on the free-standing containment vessel by allowing air flow from the annulus into upper containment. The system (included in system code 030) includes three vacuum relief penetrations for each unit. Each penetration includes a vacuum relief valve in series with a containment isolation valve. (See LRA Drawings LRA-1-47W866-1 and LRA-2-47W866-1.)

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

- Maintain an acceptable pressure differential across the free-standing containment vessel.
- Support containment pressure boundary.

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

Post-Accident Sampling Ventilation

The purpose of the post-accident sampling ventilation system is to provide heating, cooling, and ventilation for the post-accident sampling facility during normal plant operations. The system (system code 031) also provides heating, ventilation, and control of airborne radiological contamination during post-accident acquisition and testing of samples. (See LRA Drawing LRA-1,2-47W866-15.)

During normal plant operation, ventilation air is supplied to the facility via the Unit 2 auxiliary building general ventilation system and an auxiliary supply fan. Exhaust air is ducted directly to the fuel handling area exhaust fans.

During post-accident sampling operations, the normal supply and exhaust systems are isolated and ventilation air is taken directly from the outside. A supply fan provides air to the sampling side of the facility. Air is drawn from both the sample and valve gallery areas and through a gas treatment system by an exhaust fan. The radiological gas treatment subsystem consists of one

HEPA/charcoal-type air cleanup unit. The air is then discharged to the atmosphere through the shield building vent.

The isolation valves and duct which interface with the ABGTS and ABSCE support the ABGTS pressure boundary and the isolation of the ABSCE. The system has no other safety function.

The post-accident sampling ventilation system has the following intended functions for 10 CFR 54.4(a)(1).

- Support ABGTS pressure boundary.
- Support containment pressure boundary.

The post-accident sampling ventilation 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 post-accident sampling ventilation system has no intended functions for 10 CFR 54.4(a)(3).

Reactor Building Purge

The purpose of the reactor building purge ventilating (RBPV) system is to provide ventilation of the primary containment, the instrument room within the containment, and the annulus secondary containment. The system supplies fresh air for breathing and contamination control to allow personnel access for maintenance and refueling operations. The exhaust air is filtered to limit the release of radioactivity to the environment. The system includes containment penetrations and supports the secondary containment pressure boundaries but serves no other safety function. (See LRA Drawings LRA-1-47W866-1 and LRA-2-47W866-1.)

Each unit's purge system (included in system code 030) consists of two air supply fans, two air exhaust fans, two cleanup filter trains, instrument room supply fan, instrument room exhaust fan, air supply distribution system, air exhaust collection system, containment isolation valves, and system airflow control valves. Each air cleanup filter train contains a bank of prefilters, a bank of HEPA filters, and a bank of charcoal adsorbers.

Fresh air is taken from the auxiliary building air supply systems by the supply fans and routed through containment penetrations for distribution to the upper and lower containment compartments and the instrument room. The fresh air flow path ducting provides part of the ABGTS pressure boundary. Several air pickup points are located to exhaust air from the lower compartment and instrument room and to provide an air sweep across the surface at the refueling canal. Annulus purging air is taken from system ducts routed through the annulus. The purge air exhaust fans draw air from containment and the annulus through the cleanup filter trains and discharge the cleaned air through the shield building exhaust vent. To permit personnel access to the instrument room during reactor operation or during purge system shutdown, the room can be purged by the instrument room purge subsystem fans using the main system ducts and filter train.

The system air supply and exhaust ducts are routed through the secondary containment to several primary containment penetrations. Screens are provided inboard of the inboard containment isolation valve on supply and exhaust penetrations as required to prevent foreign material from restricting isolation valve closure. The screens are safety-related.

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

- Support containment pressure boundary.

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

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

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

Emergency Gas Treatment

The purpose of the emergency gas treatment system (EGTS) (system code 065) is to maintain the annular space (annulus) between the shield building and the containment at a negative pressure for all plant operating conditions, including accidents and following an accident, to remove radioactive iodine and particulates from the annulus air prior to discharge to the atmosphere. This system has two subsystems: the annulus vacuum control subsystem and the air cleanup subsystem. During normal operation, the annulus vacuum control subsystem of the EGTS exhausts air directly from the annulus to maintain a negative pressure with respect to the auxiliary building. Following an accident, the air cleanup subsystem of the EGTS draws air from the annulus and filters it to remove radioactive iodine and particulates. It then recirculates the air back into the annulus and exhausts a small portion to maintain the annulus at a negative pressure with respect to the outside atmosphere. (See LRA Drawings LRA-1-47W866-1 and LRA-2-47W866-1.)

The annulus vacuum control subsystem establishes and maintains a negative pressure within the annulus using four annulus vacuum control fans (two per unit), dampers, ducting, and associated instrumentation. It is used during normal operations when containment integrity is required. The subsystem draws air from the annulus and from the auxiliary building at varying rates as needed to maintain a negative annulus pressure. The fans discharge into the fuel handling area exhaust system to the auxiliary building exhaust vent. Following an accident, this subsystem is isolated and shutdown. Other than isolation from the remainder of the EGTS, this subsystem supports no safety function.

The air cleanup subsystem is started following an accident to maintain the annulus air volume below atmospheric pressure and remove airborne particulates and vapors. The subsystem uses two emergency gas treatment exhaust fans, two filter units, dampers, ducting, and associated instrumentation. The fans draw air from the annulus through the filter units and return the air to the annulus or vent it to atmosphere. The portions of the air stream that are returned to the annulus air space or discharged from the shield building exhaust vent are adjusted as needed to maintain a negative annulus air pressure. The air filter units each include a moisture separator, relative humidity heater, prefilter bank, HEPA filter bank, two banks of carbon adsorbers in series, and another HEPA filter bank. Cross-over air flow ducts can be used if needed to cool the filters and adsorbers in an inactive air cleanup unit.

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

- Following an accident, maintain the containment annulus air pressure below atmospheric and remove airborne particulates and vapors that may contain radioactive nuclides from air drawn from the annulus.

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

<u>UFSAR References</u>

Section 6.2.3

Section 9.4

Components Subject to Aging Management Review

Components of the containment vacuum relief and reactor building purge ventilation systems that support containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations. Other components of the auxiliary building ventilation system not included in this review are reviewed in Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining components of the auxiliary building and reactor building gas treatment and ventilation systems 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.

Auxiliary Building	*Reactor Building*
LRA-1,2-47W866-2	LRA-1-47W866-1
LRA-1,2-47W866-8	LRA-2-47W866-1
LRA-1,2-47W866-10	LRA-1-47W845-3
LRA-1,2-47W866-11	LRA-2-47W845-3
LRA-1,2-47W845-2	LRA-1,2-47W865-5

Post-Accident Sampling Facility

LRA-1,2-47W866-15

Table 2.3.3-5
Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Coil	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (tubes)	Pressure boundary Heat transfer
Heat exchanger housing	Pressure boundary
Heater housing	Pressure boundary
Package unit	Pressure boundary
Piping	Pressure boundary
Regulator	Pressure boundary
Screen	Filtration
Separator	Pressure boundary Filtration
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.6 Control Building HVAC

System Description

The purpose of the control building heating, ventilating, air-conditioning, and air cleanup systems is to maintain temperature and humidity conditions suitable for equipment operation and safe occupancy of the main control room (MCR) habitability zone during normal operation or following an accident. The control building HVAC systems (primarily system code 311, which is synonymous with 31A) consist of the following subsystems (see LRA Drawing LRA-1,2-47W866-4):

- MCR Air-Conditioning System and Electrical Board Rooms (EBR) Air-Conditioning System
- MCR Emergency Air Cleanup System
- MCR Emergency Pressurization System
- Battery Room Ventilation System
- Miscellaneous Ventilation Systems

MCR and EBR Air-Conditioning Systems

The main control room air-conditioning system equipment supplies the main control room, technical support center, and other rooms on elevation 732. The electrical board rooms air-conditioning system equipment supplies the battery rooms, battery board rooms, communications rooms, and other rooms on elevation 669, and the computer and auxiliary instrument rooms at elevation 685. Each of these air-conditioning systems includes two refrigerant condensing units cooled by ERCW, two air handling (fan-coil) units, two filter banks, air supply and return ducts, dampers, heaters, grilles, and controls.

During normal operation, fresh air for the control building is passively taken from the outdoors. The air flow is induced by the exhaust fans located within the control building. During accident conditions, double isolation dampers automatically close to prevent the supply of fresh air to the main control room and spreading room floors. Induced air flow to the rooms of the lower floors is provided to replace the air exhausted from the battery rooms to maintain these rooms at a negative pressure relative to the main control room. In the event of a design basis flood, the main control room air-conditioning system provides air conditioning to the shutdown board rooms and auxiliary control room.

MCR Emergency Air Cleanup System

The main control room emergency air cleanup system includes two emergency air cleanup fans and two air cleanup filter/fan assemblies. Each air cleanup filter assembly consists of a bank of HEPA filters followed by a bank of charcoal adsorbers. This system starts automatically on a safety injection signal, a high radiation signal in the fresh air supply, high temperature in the fresh air supply, or by manual actuation. During air cleanup system operation, a portion of the control room air-conditioning system return air is continuously routed through one or both of the HEPA filter-charcoal adsorber trains.

MCR Emergency Pressurization System

The main control room is pressurized with filtered outdoor air during operation of the control room emergency air cleanup system. To minimize the in-leakage of unprocessed air, the system maintains a positive pressure in the main control room and other rooms in the habitability zone relative to adjoining spaces and the outside atmosphere. The MCR emergency pressurization system includes two supply fans which draw fresh air from either of two air intakes. Each emergency pressurizing fan discharges to the control room air-conditioning system return air at a point upstream of the air cleanup filter assembly trains.

Battery Room Ventilation System

The battery rooms ventilation system consists of three exhaust fans, with two on standby, discharging battery room air to the outdoors. During control room isolation, a continuous stream of fresh air is drawn in through the electrical board room's air handling unit to replace that exhausted from each battery room. The battery rooms ventilation system is required to operate at all times, except during the design basis flood, to prevent the potential accumulation of hydrogen gas.

Miscellaneous Ventilation Systems

The spreading room is ventilated by one of two spreading room exhaust fans which exhaust to the outdoors. One spreading room supply fan supplies air to the spreading room. During control room isolation the spreading room supply and exhaust fan are cut off and isolation dampers close to prevent leakage of unfiltered air into the control room.

The toilet, kitchen, and locker rooms at elevation 732 are ventilated by exhausting a portion of the control room air-conditioning system return air through the rooms. The toilet and locker rooms exhaust fan discharges to the outdoors. During control room isolation, the toilet and locker rooms exhaust fan is shutdown, and double isolation dampers close to prevent leakage of unfiltered air into the control room.

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

- Maintain an acceptable environment for the operation of safety-related electrical and mechanical equipment.
- Maintain the main control room habitability zone at a slight positive pressure and recirculate and purify the main control room air and incoming emergency pressurization air.

- Maintain acceptable hydrogen concentrations in battery rooms.
- Support ERCW system pressure boundary.
- Support isolation of the main control room during an accident condition.
- Provide air conditioning of the shutdown board rooms and auxiliary control room in the event of a design basis flood.

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

- Perform a function (fire barriers [dampers] and ventilation for safe shutdown equipment) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR References

Section 9.4.1

Components Subject to Aging Management Review

Components that support HVAC flood mode operation are reviewed in Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining control building HVAC 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.

<u>License Renewal Drawings</u>

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

LRA-1,2-47W865-3

LRA-1,2-47W865-7

LRA-1,2-47W866-4

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

Component Type	Intended Function
AHU housing	Pressure boundary
Bolting	Pressure boundary
Coil	Pressure boundary
Compressor housing	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Piping	Pressure boundary
Separator housing	Pressure boundary
Sight glass	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.7 Compressed Air

System Description

The purpose of the compressed air systems is to supply adequate compressed air capacity for general plant service, instrumentation, testing, and control. The compressed air systems are common to both units and include the control air system (system code 32) and the service air system (system code 33). The service air system provides compressed air throughout the plant for general purpose use. The control air system provides compressed air for instrumentation and controls.

The control air system includes a safety-related subsystem, the auxiliary control air (ACA) system, that supplies air to vital equipment of Units 1 and 2. The ACA system ensures that all vital equipment will have an adequate instrument-grade air supply during both normal and accident conditions. The remaining nonsafety-related components of the control air system and the components of the service air system comprise the station control and service air (SCSA) system.

SCSA is supplied by two motor-driven reciprocating compressors, two motor-driven centrifugal compressors, and one motor-driven rotary screw service air compressor. The system includes normal accessory equipment such as cylinder cooling equipment, aftercoolers, and safety relief valves. The station control air compressors discharge into two redundant headers. These headers feed the two control air receivers which in turn supply air through redundant headers to the control air station. The control air station contains three complete trains of prefilters, dryers, and afterfilters. The control air is then piped through headers to valves, controllers, instruments, etc. throughout the plant. Service air is supplied to the service air receiver by a single header and by the single rotary screw compressor. The air is not processed through dryers and filter trains as is done for the control air. Service air is piped from the receiver to service outlets and miscellaneous equipment throughout the plant. Service air is provided inside containment and the system includes components that support the containment pressure boundary, which is the only safety function of the service air system.

The ACA system is separated into two independent trains, each containing its own compressor, aftercooler, receiver, dryer, and filters. The compressors and aftercoolers are cooled by ERCW. Manual bypasses are provided around each dryer train for emergency operation and to facilitate dryer maintenance. The ACA piping is arranged so that the auxiliary receivers are charged from the SCSA system during normal operation. The ACA system compressors start automatically when SCSA pressure reduces below the required minimum. Each compressor is sized to supply one ESF train the total safety-related control air requirements of both units in the event of an accident, flood, or loss of the SCSA system.

Air cylinders, accumulators, and regulators are provided for the steam-driven auxiliary feedwater pump level control valves. These support opening or closing the valves during a station blackout.

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

- Supply instrument-grade air to vital equipment during both normal and accident conditions.
- Support ERCW system pressure boundary.
- Support containment pressure boundary.

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

- Perform a function (support for safe shutdown equipment) 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).

UFSAR References

Section 9.3.1

The control air system (system code 32) and the service air system (system code 33) comprise the station control and service air system and the auxiliary control air system for emergency use as described in the UFSAR.

Components Subject to Aging Management Review

A small number of components associated with essential raw water cooling to the air compressors are evaluated in Section 2.3.3.11, Essential Raw Cooling Water. Components of the service air system that support containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining compressed air 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-1,2-47W848-1	LRA-1-47W845-6
LRA-1,2-47W848-12	LRA-2-47W845-4

Table 2.3.3-7
Compressed Air System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Dryer	Pressure boundary
Filter housing	Pressure boundary
Flex connection	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)	Pressure boundary Heat transfer
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.8 Station Drainage

<u>System Description</u>

The purpose of the station drainage and sewage systems (system codes 040 and 305) is to provide drainage for various equipment and buildings and to collect and process sewage from the plant facilities. The station drainage system collects building roof and floor drains, equipment drains, and yard drainage from the entire site, with the exception of the reactor buildings and auxiliary building which use the waste disposal system (system code 077, Section 2.3.3.13) for drainage collection. The station drainage and sewage systems together provide the sanitary water services for the plant. The systems include pumps, sumps, piping, valves, instruments and controls.

The station drainage system includes safety-related and nonsafety-related equipment that provides protection to plant equipment during a design basis flood (natural flood above plant grade). This equipment includes two deck sump pumps in the ERCW pumping station that provide protection for ERCW safety-related equipment, two SFP cooling pump platform sump pumps that provide protection for the SFP pumps, and drain lines and isolation valves that protect the diesel generator building from flooding.

The system includes nonsafety-related equipment that forms part of the auxiliary building secondary containment envelope or part of the MCR habitability system pressure boundary. Some drains in the auxiliary and control buildings are equipped with loop seals to assure these pressure boundaries are maintained.

The station drainage system also includes valves in the ERCW screenwash strainer backwash drains that support ERCW system operation.

The station drainage and sewage systems have the following intended functions for 10 CFR 54.4(a)(1).

- Provide for the protection of plant equipment during a design bases flood.
- Support ERCW system operation.

The station drainage and sewage systems have the following intended functions for 10 CFR 54.4(a)(2).

- Provide for the protection of plant equipment during a design bases flood.
- Support containment pressure boundary.
- Support MCR habitability system pressure boundary.

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

The station drainage and sewage systems have no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Appendix 2.4A

Section 9.2.4.2

Section 9.3.3.1

Components Subject to Aging Management Review

The valves in the ERCW screenwash strainer backwash drains that support ERCW system operation are evaluated in Section 2.3.3.11, Essential Raw 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 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining station drainage 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-1,2-47W815-2	LRA-1,2-47W853-10
LRA-1,2-47W852-3	LRA-1,2-47W853-11
LRA-1,2-47W852-4	LRA-1,2-47W855-1
LRA-1,2-47W853-1	LRA-1,2-47W853-6

Table 2.3.3-8
Station Drainage System
Components Subject to Aging Management Review

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

2.3.3.9 Sampling and Water Quality

System Description

The purpose of the sampling and water quality system (system code 043) is to obtain water and gas samples from process systems, waste collection systems and sumps. The system includes post-accident sampling equipment. The samples are obtained in and routed to various locations including the secondary chemistry sampling facility, hot sample room, post-accident sampling facility, condensate demineralizer building, and locally (grab samples) for laboratory analysis. The system includes heat exchangers to cool samples, pumps as needed to transfer samples to sampling stations, pressure regulators, holding tanks, sample sinks, analyzers, piping, valves, instruments and controls.

The system includes piping and valves that comprise part of the pressure boundary of the sampled system. Where the system is safety-related, the sampling system components are also safety-related. The system includes a sample sink isolation valve that forms part of the pressure boundary of the waste gas vent header of the waste disposal system. The post-accident sampling system uses sample coolers serviced by the safety-related component cooling system (CCS), so the coolers, which form part of the CCS pressure boundary, are safety-related. The post-accident sampling system has no other safety function.

The sampling and water quality system also includes piping, valves and components that support the containment pressure boundary. The system performs no other safety functions.

The sampling and water quality system has the following intended functions for 10 CFR 54.4(a)(1).

- Support pressure boundary of sampled safety-related systems.
- Support pressure boundary of the waste disposal system.
- Support component cooling water system pressure boundary.
- Support containment pressure boundary.

The sampling and water quality 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 sampling and water quality system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 9.3.2

Section 9.5.10

Components Subject to Aging Management Review

The valve supporting the waste disposal system pressure boundary is evaluated in Section 2.3.3.13, Waste Disposal. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining sampling 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 drawings.

LRA-1,2-47W881-5	LRA-1,2-47W803-2	LRA-2-47W811-1
LRA-1,2-47W881-5-1	LRA-1-47W809-1	LRA-1,2-47W813-1
LRA-1-47W881-6	LRA-2-47W809-1	LRA-1,2-47W845-2
LRA-2-47W881-6	LRA-1,2-47W809-3	LRA-1,2-47W859-1
LRA-1,2-47W881-7	LRA-1,2-47W809-5	LRA-1-47W859-2
LRA-1,2-47W881-8	LRA-1,2-47W809-7	LRA-1,2-57521
LRA-1,2-47W881-9	LRA-1,2-47W810-1	LRA-1,2-57523
LRA-1,2-47W801-2	LRA-1-47W811-1	

**Table 2.3.3-9
Sampling and Water Quality System
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Regulator	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.10 Chemical and Volume Control

System Description

The purpose of the chemical and volume control system (CVCS) (system code 062) is to manage the coolant inventory and chemistry of the reactor coolant system. During normal operation, the CVCS maintains pressurizer level, controls the concentration of boron and other chemicals, removes corrosion and fission products from the coolant, and provides seal-water injection flow to the reactor coolant pumps. Following an accident, the CVCS provides high-head coolant injection as part of the emergency core cooling system. The CVCS consists of the charging, letdown and seal water subsystem and the chemical control, purification and makeup subsystem.

Components of the charging, letdown and seal water subsystem include heat exchangers (regenerative, seal water and letdown), letdown orifices, volume control tank, two centrifugal charging pumps, filters, piping, valves, instruments, and controls. Reactor coolant discharged from the reactor coolant loop piping flows through the regenerative heat exchanger where its temperature is reduced by heat transfer to the charging flow. The coolant pressure is reduced by the letdown orifice(s) and coolant temperature is further reduced by the letdown heat exchanger. The coolant then flows through the reactor coolant filter and into the volume control tank through a spray nozzle in the top of the tank. The gas space in the volume control tank is filled with hydrogen. The partial pressure of hydrogen in the volume control tank determines the concentration of hydrogen dissolved in the reactor coolant. The charging pumps normally take suction from the volume control tank and return the cooled, purified reactor coolant to the RCS through the charging line. The bulk of the charging flow is pumped back to the RCS through the regenerative heat exchanger where its temperature is raised by heat transfer from the letdown flow. The flow is then injected into a cold leg of the RCS. Control of the letdown and charging flow rates provides normal control of the pressurizer level.

A portion of the charging flow is directed to the reactor coolant pumps through a seal water injection filter. It is injected between the pump shaft bearings and the thermal barrier cooling coil. Some of the flow enters the RCS around the thermal barrier and the remainder is directed up the pump shaft, cooling the lower bearing. Most of this flow leaves the pump seal package and is returned to the CVCS through the seal water return filter and the seal water heat exchanger to the suction side of the charging pumps or to the volume control tank.

The seal water and letdown heat exchangers are cooled by the CCS, and the centrifugal charging pump oil coolers are cooled by ERCW. The heat exchangers and coolers form part of the pressure boundaries of their respective cooling water systems.

At various points along the charging, letdown and seal water subsystem flow path, flow can be diverted to or returned from the chemical control, purification and makeup subsystem. Components of the chemical control, purification and makeup subsystem include demineralizers, boric acid tanks, boric acid transfer pumps, holdup tanks, holdup tank recirculation pump, and various pumps, tanks, filters, piping, valves, instruments and controls. The subsystem supports pH and oxygen control, removal of impurities, addition or removal of boron as needed for reactivity control, and the addition or removal of coolant inventory.

The centrifugal charging pumps provide high-head coolant injection as part of the emergency core cooling system. For emergency boration and makeup, the pumps can take suction directly from the refueling water storage tank or boric acid tanks.

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

- Maintain the coolant inventory in the RCS.
- Provide high-head injection of borated water to the RCS.
- Regulate the concentration of boron in the reactor coolant. Inject boric acid into the RCS during conditions that require boration.
- Provide seal water to the reactor coolant pump seals during all pump operations.
- Maintain integrity of reactor coolant pressure boundary.
- Support the CCS and ERCW system pressure boundaries.
- Support containment pressure boundary.

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

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

<u>UFSAR References</u>

Section 9.3.4

<u>Components Subject to Aging Management Review</u>

Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.3, Reactor Coolant Pressure Boundary. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining CVCS 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-1-47W809-1	LRA-1,2-47W809-5	LRA-1,2-47W866-11
LRA-2-47W809-1	LRA-1,2-47W819-1	LRA-1,2-47W881-7
LRA-1,2-47W809-2	LRA-1-47W859-2	LRA-1,2-47W881-9
LRA-1,2-47W809-3	LRA-2-47W859-3	LRA-1-47W811-1
LRA-1,2-47W809-4	LRA-1,2-47W859-4	LRA-2-47W811-1

Table 2.3.3-10
Chemical and Volume Control System
Components Subject to Aging Management Review

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

2.3.3.11 Essential Raw Cooling Water

System Description

The purpose of the essential raw cooling water (ERCW) system (system code 067) is to supply cooling water to various safety-related and nonsafety-related heat loads under all the postulated modes of plant operation. The system provides an uninterrupted source of cooling water from and to the ultimate heat sink, the Tennessee River. The ERCW system supplies water to the following components during normal operation:

- Component cooling heat exchangers
- Containment spray heat exchangers
- Emergency diesel generators
- Control building air-conditioning systems
- Auxiliary building space coolers (for safeguard equipment)
- Containment ventilation system coolers
- Auxiliary control air compressors
- Reactor coolant pump motor coolers
- Control rod drive ventilation coolers

The ERCW system serves as an alternate cooling supply to the station air compressors through normally closed connections to the raw cooling water system. The system serves as a source of emergency makeup to the steam generators through normally closed connections to the auxiliary feedwater system. The system can also serve as a source of emergency makeup to the component cooling system surge tank through a temporary spool piece connection to normally blanked flanges.

In the event of extreme flooding conditions, temporary spool piece connections can be made to normally blanked flanges of the component cooling and raw cooling water systems to support the following:

- Spent fuel pit heat exchangers
- Sample heat exchangers
- Reactor coolant pump thermal barriers
- Ice machine refrigeration condensers
- Residual heat removal heat exchangers

The ERCW system consists of four traveling water screens and associated wash pumps, eight ERCW pumps, four strainers, and associated valves, piping, instruments, and controllers. Supply water for the ERCW pumps enters the pumping station through each of four traveling water screens directly into a corresponding ERCW pump pit from which two ERCW pumps take suction. Water is distributed from the ERCW pumping station through four independent sectionalized supply headers designated 1A, 2A, 1B, and 2B. Four ERCW pumps are assigned to train A, and four to train B.

ERCW supplies water to the diesel generators, auxiliary building, control building, reactor containment building, and the ERCW pumping station. Discharge from the various heat exchangers served by the ERCW system goes to an open basin with overflow capability and then flows by gravity to the return channel of the natural draft cooling towers of the condenser circulating water system.

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

- Provide cooling water to various safety and nonsafety-related components during normal operating and accident conditions, including flood mode operation.
- Provide makeup flow to the auxiliary feedwater pumps and component cooling surge tank.
- Support containment pressure boundary.

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

- Provide for the protection of plant equipment during a design bases 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 ERCW system has the following intended function for 10 CFR 54.4(a)(3).

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

UFSAR References

Appendix 2.4A

Section 9.2.2

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 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining ERCW 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-1,2-47W845-1	LRA-2-47W845-4	LRA-1-47W859-2
LRA-1,2-47W845-2	LRA-1,2-47W845-5	LRA-2-47W859-3
LRA-1-47W845-3	LRA-1-47W845-6	LRA-1,2-47W860-1
LRA-2-47W845-3	LRA-1,2-47W859-1	

Table 2.3.3-11
Essential Raw Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Coil	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary Flow control
Nozzle	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Valve body	Pressure boundary

2.3.3.12 Component Cooling

System Description

The purpose of the component cooling system (CCS) (system code 070) is to provide cooling to potentially radioactive systems including the chemical and volume control, residual heat removal, sampling, reactor coolant, waste disposal, safety injection, spent fuel pool cooling, and containment spray systems. The CCS provides cooling to various safety-related and nonsafety-related heat loads and is an intermediate cooling loop to prevent release of radioactive contaminated water into the environment via the ERCW system, which cools the CCS.

The component cooling system is a closed-loop, two-train cooling system consisting of five CCS pumps (two per unit and one common), two thermal barrier booster pumps per unit, three pairs of component cooling heat exchangers (one pair per unit and one common), one surge tank per unit, a CCS pump seal water collection unit, and associated valves, piping and instrumentation serving both units. Component cooling water is circulated first through the component cooling system heat exchangers, to the components using the cooling water, and finally back to the pump suction. The surge tank for each unit has an internal baffle divider to provide two separate surge volumes for safeguard train separation. Each surge tank section is tied into the safeguard header on the suction of the pump.

Under normal power operation, the CCS will require the use of one unit-specific component cooling water pump and the unit-specific component cooling heat exchangers for each unit. One additional component cooling water pump may be needed in the unit carrying the SFP heat exchanger. In the event of an accident, either unit (accident unit) may be aligned with two completely independent cooling system trains serving safeguard equipment. Each safeguard cooling train consists of one pump, one heat exchanger pair, and a separate compartment in the unit surge tank. The common component cooling heat exchanger pair and common CCS pump (C-S) are aligned to the accident unit during the safety injection phase of a LOCA.

The CCS is designed to permit connections to the ERCW system during flood mode operation. Spool pieces can be installed between normally blind flanged sections of the CCS and ERCW supply and discharge headers. Cold water would enter the CCS from the ERCW supply header, cool the safety-related heat loads served by the CCS, then discharge into the ERCW discharge header.

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

- Provide cooling water to remove waste heat from safety-related heat exchangers during normal operations and post-accident conditions.
- Support connections to the ERCW system to remove waste heat from safety-related heat exchangers in the event of a natural flood above plant grade.

- Support the essential raw cooling water system pressure boundary.
- Support containment pressure boundary.

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

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

UFSAR References

Section 9.2.1

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 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining CCS 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.

LRA-1,2-47W859-1	LRA-1,2-47W859-4	LRA-1,2-57521
LRA-1-47W859-2	LRA-1,2-47W845-2	
LRA-2-47W859-3	LRA-1,2-47W856-1	

Table 2.3.3-12
Component Cooling System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Condenser housing	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (end cover)	Pressure boundary
Heat exchanger (plates)	Pressure boundary Heat transfer
Piping	Pressure boundary
Plate	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

2.3.3.13 Waste Disposal

System Description

The purpose of the waste disposal system (system code 077) is to collect, process and dispose of radioactive waste. The waste disposal system includes the liquid, gaseous and solid waste processing systems, the nitrogen system, and portions of the hydrogen system that supply gas to the CVCS volume control tank. The system includes isolation valves and piping for containment penetrations.

The liquid waste processing system receives, segregates, processes, recycles for further processing, and discharges liquid wastes. The system consists of various collection tanks, sumps, pumps, filters, strainers, and the associated piping, valves, and instrumentation used to collect waste from the containments and auxiliary building. Liquids are processed as necessary for release to the environment using vendor-supplied demineralizers and filters.

The system includes the containment floor and equipment drain sump and sump pumps. These sump pumps can be aligned during flood mode (natural flood above plant grade) operations to remove water from containment.

The gaseous waste disposal system removes fission product gases from the primary side nuclear steam supply system and processes them for internal recirculation or release to the atmosphere. The system consists of two waste-gas compressor packages, nine gas decay tanks, and the associated piping, valves and instrumentation. Waste gas, received by the compressors via the vent header, is compressed and flows into one of the nine gas decay tanks. The gas can then be returned to the CVCS holdup tanks for reuse as cover gas or remain in the decay tank prior to being discharged into the atmosphere. Before release to the atmosphere, the decayed gases travel through an activated carbon unit, a HEPA filter, and a radiation monitor. The waste gas compressor packages, gas decay tanks, and connecting components are safety-related. The rupture of a waste gas decay tank is an analyzed event with dose consequences that are compared to 10 CFR 100 limits. The waste gas compressor heat exchanger is cooled by the CCS and forms part of the pressure boundary of that system.

The solid waste disposal system supports the collection, processing, packaging, and disposal of solid wastes. The system includes equipment to transfer, store and package spent demineralizer resins. It also includes compactors used to compress solid wastes for packaging.

The nitrogen system provides nitrogen gas for various purposes throughout the plant. Nitrogen gas is supplied by a liquid nitrogen storage/vaporizer system, by bottled gas, or by use of a tank truck. The system is divided into a low pressure section and a high pressure section. The high pressure section supports pressurization of the cold leg accumulators and inerting of the steam generators. The low pressure section is used to fill or purge the vapor space of various components to either reduce the hydrogen concentration of stored gas by dilution or replace fluid that has been removed.

The portion of the hydrogen system included in the waste disposal system supplies hydrogen gas to the CVCS volume control tank (VCT). The system includes pressure regulators, piping and valves from the hydrogen distribution system in the yard to the CVCS.

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

- Maintain the pressure boundary of safety-related waste gas disposal system components credited in the waste gas decay tank rupture analysis.
- Support the CCS pressure boundary.
- Support containment pressure boundary.

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

- Remove water from containment in the event of a natural flood above plant grade.
- Maintain integrity of nonsafety-related components such that no physical interaction with safety-related components could prevent satisfactory accomplishment of a safety function.

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

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

UFSAR References

Section 9.5.8
Section 9.5.9
Section 11.2
Section 11.3
Section 11.5

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 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining waste disposal system components 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 drawings.

LRA-1-47W809-1	LRA-1,2-47W830-3	LRA-1,2-47W859-1
LRA-2-47W809-1	LRA-1,2-47W830-4	LRA-1,2-47W881-5
LRA-1,2-47W809-3	LRA-1,2-47W830-6	LRA-1,2-47W881-7
LRA-1,2-47W809-7	LRA-1,2-47W830-7	LRA-1,2-47W814-2
LRA-1,2-47W830-1	LRA-1,2-47W851-1	

Table 2.3.3-13
Waste Disposal System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Expansion joint	Pressure boundary
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Screen	Filtration
Sight glass	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vortex breaker	Pressure boundary

2.3.3.14 Spent Fuel Pit Cooling

System Description

The review of the spent fuel pit cooling (SFPC) system (system code 078) includes the fuel handling and storage system (system code 079).

Spent Fuel Pit Cooling

The purpose of the SFPC system (also called the spent fuel pool cooling system) is to remove decay heat generated by spent fuel assemblies stored in the spent fuel pit. The system clarifies and purifies the water in the spent fuel pit, transfer canal, and refueling water storage tanks. In the event of extreme flooding of the site during refueling operations, the system also supports cooling of the reactor core.

The SFPC system (common to both units) consists of two cooling trains with a pump and heat exchanger (plus a backup pump capable of operation in either train), a purification loop with a demineralizer, and a surface skimmer loop with a pump and filter. The system also includes the gate valves on the spent fuel pit side of the fuel transfer tube, which serve as secondary containment isolation valves, and the containment penetrations supporting purification of the refueling canal water.

When the cooling system is in operation, water from the spent fuel pit is pumped through the tube side of the heat exchanger and returned to the pit. Heat is transferred from the heat exchangers to the component cooling system. The pump suction lines are located four feet below the normal spent fuel pit water level, while the return line contains an anti-siphon hole near the surface of the water to prevent gravity drainage of the pit.

A portion of the spent fuel pit water may be diverted through a demineralizer and a filter to maintain spent fuel pit water clarity and purity. The spent fuel pit demineralizer may also be used in conjunction with a refueling water purification pump and filter to clean and purify the refueling water while spent fuel pit heat removal operations proceed. Connections are provided such that the refueling water may be pumped from either the refueling water storage tank or the refueling cavity of either unit, through the demineralizer and filter, and discharged to the refueling cavity or refueling water storage tank of either unit.

The water surface is cleaned by a skimmer loop. Water is removed from the surface by the skimmers, pumped through a strainer and filter, and returned to the pit surface at three locations remote from the skimmers.

To maintain the water level and minimum boron concentration requirements, a flow path is available from the RWST through the refueling water purification pumps to the spent fuel pit cooling loop. Other sources of makeup to replace evaporative losses are from the demineralized water system and the fire protection system. Borated water may be supplied from connections with the CVCS.

If a warning of flood above plant grade is received when one or both reactor vessels are open or vented to the containment atmosphere, the SFPC system will be connected to the residual heat removal system using prefabricated, in-position spool pieces which are normally disconnected. Using this connection, the SFPC system heat exchanger output flow will be directed to the RHR system heat exchanger bypass line. Water delivered to the RCS piping by the RHR system returns to the spent fuel pool by way of the refueling canal and fuel transfer tubes.

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

- Remove the decay heat from the spent fuel assemblies and maintain the spent fuel pit water temperature and boron concentration.
- Support core cooling during design basis flood by connection to RHR system.
- Support the component cooling system pressure boundary.
- Support containment pressure boundary.

The SFPC system has the following intended functions 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.
- Support the transfer of water from the RWST as the backup source of makeup water to the spent fuel pit.

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

Fuel Handling and Storage

The purpose of the fuel handling and storage system (system code 079) is to support the handling and storage of new and spent fuel assemblies. The system includes fuel handling equipment such as the fuel handling bridges and cranes, fuel elevators and transfer conveyors, and fuel storage equipment including the spent fuel storage racks and dry cask storage equipment.

The spent fuel storage racks are modular, free-standing, high density racks. The racks use Boral as a thermal neutron absorber for criticality control. The Boral sheets are axially centered with respect to the active fuel region and are sandwiched between storage cells.

The Boral neutron absorption sheets are evaluated as mechanical components. The fuel handling and storage system contains no other mechanical components with an intended function. Fuel handling equipment and spent fuel pool structures, including the storage racks, are evaluated as structural components.

The fuel handling and storage system has the following intended function for 10 CFR 54.4(a)(1).

- Provide criticality protection. This function is performed by Boral neutron absorption sheets in the pool racks.

The fuel handling and storage system has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

UFSAR References

Appendix 2.4A	Section 9.1
Section 6.2.1.3.2	Section 9.1.3

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 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining SFPC system components and the Boral neutron absorption sheets 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-1,2-47W855-1

LRA-1,2-47W859-1

Table 2.3.3-14
Spent Fuel Pit Cooling System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Flow element	Pressure boundary Flow control
Heat exchanger (channel head)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheet)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Neutron absorber	Neutron absorption
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.15 Standby Diesel Generator

System Description

The purpose of the standby diesel generator system (system code 082) is to supply power to safety systems via the 6.9KV shutdown boards in the event offsite power is lost. The diesel generator sets, normally in a standby condition, will start automatically in the event of sustained low voltage on the 6.9KV shutdown boards or in the event of a safety injection signal.

There are four diesel generator sets. Each set consists of two 16-cylinder engines connected directly to a generator in a tandem arrangement; that is, each set consists of two diesel engines with a generator between them, connected together to form a common shaft. The system includes the diesel engines and generators, air start, cooling, lubrication, combustion air and exhaust subsystems, instruments and controls. This system also includes the engine-driven fuel oil priming pumps. The fuel oil system (system code 018) provides fuel oil for the diesel. The system also includes a fifth diesel generator set, most components of which have been functionally abandoned. The fifth diesel generator equipment is physically isolated from the other diesels and other safety-related equipment and has no intended function for license renewal.

Each diesel engine is equipped with an independent air starting system. Four starting air motors and two air accumulators are provided for each diesel engine. Each accumulator set is sized for an air storage capacity sufficient to start the engine five times without recharging. Two air compressors are provided for each diesel generator set.

A closed-circuit jacket cooling water system including pumps, heat exchanger, expansion tank, piping and valves supports each engine. The engine cooling water is circulated through the shell side of the heat exchanger by two engine-shaft-driven pumps. The heat sink for the engine cooling water loop is provided by the ERCW system, which flows through the tube side of the heat exchanger. Thermostatically controlled jacket water immersion heaters are provided for each engine to maintain the jacket water temperature while the diesel generators are in standby mode.

Each diesel engine has a lube oil circulating pump for use while the engine is not running. The oil is continuously circulated and held at a relatively constant temperature while the engine is in standby. During engine operation, the lubricating oil system supplies oil to lubricate engine and turbocharger components and to cool the pistons.

Combustion air is provided through an oil bath air filter and connecting piping to the engine turbochargers. Engine exhaust drives the turbocharger, passes through a silencer and is discharged outside the diesel generator building.

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

- Supply power to safety systems via the 6.9KV shutdown boards in the event offsite power is lost.
- Support the ERCW system pressure boundary.

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

- Perform a function (support shutdown from outside the control room) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR References

Section 8.3.1.1	Section 9.5.6
Section 9.5.5	Section 9.5.7

Components Subject to Aging Management Review

Fuel oil supply components are reviewed in Section 2.3.3.1, Fuel Oil. Nonsafety-related components of the system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining standby diesel generator components are reviewed as listed below.

Table 2.3.3-15 lists the component types that require aging management review.

Table 3.3.2-15 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-1,2-47W816-2	LRA-1,2-47W845-1
LRA-1,2-47W839-1	LRA-1,2-A950F04001

Table 2.3.3-15
Standby Diesel Generator System
Components Subject to Aging Management Review

Component Type	Intended Function
Air start motor housing	Pressure boundary
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Flex connection	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)	Pressure boundary Heat transfer
Heater housing	Pressure boundary
Lubricator housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Silencer	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbocharger	Pressure boundary
Valve body	Pressure boundary

2.3.3.16 Flood Mode Boration Makeup

System Description

The purpose of the flood mode boration makeup system (system code 084), also referred to as the auxiliary charging system, is to provide makeup to the reactor coolant system during extreme flooding conditions. This system includes safety-related and nonsafety-related equipment used in flood protection provisions and is common to both units. The system includes four auxiliary charging pumps (two per unit), two auxiliary charging booster pumps, an auxiliary makeup tank, demineralizer, filter, piping and valves.

The system is normally isolated from other systems by blank flanges and maintained in a dry condition. If required during extreme flooding conditions, spool piece connections are made to the waste disposal systems and the chemical and volume control systems for each unit. The initial supply of makeup water is from the demineralized water tanks. The connection to the waste disposal system, on the discharge line from the reactor coolant drain tank pumps, provides various sources of makeup water to the auxiliary makeup tank. Auxiliary makeup water in the tank can be borated to the extent necessary to maintain refueling shutdown concentration in the RCS. The booster pumps draw from the tank to supply the auxiliary charging pumps that inject makeup water through the spool piece connection to the CVCS and into the RCS via the normal charging line. The makeup water can be processed through the demineralizer and filter if necessary. The system includes components within the isolation boundary of containment penetrations.

The flood mode boration makeup system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide borated make-up to the reactor coolant system during design basis flood.
- Support containment pressure boundary.

The flood mode boration makeup system has the following intended function for 10 CFR 54.4(a)(2).

- Provide borated make-up to the reactor cooling system during design basis flood.

The flood mode boration makeup system has no intended functions for 10 CFR 54.4 (a)(3).

UFSAR References

Appendix 2.4A

Section 9.3.5

Components Subject to Aging Management Review

Flood mode boration makeup components are reviewed as listed below.

Table 2.3.3-16 lists the component types that require aging management review.

Table 3.3.2-16 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-1,2-47W809-7

Table 2.3.3-16
Flood Mode Boration System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.3.17 Miscellaneous Auxiliary 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 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 SQN, 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 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 oil, steam or liquid 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
012	Auxiliary Boiler	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
018	Fuel Oil	Section 2.3.3.1, Fuel Oil
020	Central Lubricating Oil	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
024	Raw Cooling Water	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
025	Raw Service Water	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
026	High Pressure Fire Protection	Section 2.3.3.2, High Pressure Fire Protection
028, 928	Water Treatment System and Makeup Water Treatment Plant	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
029	Potable (Treated) Water Distribution	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

System Code	System Name	Section Describing System
030, 300; 31A, 311; 31C, 313; 044, 440	Containment and Diesel Generator HVAC; Control Building HVAC; Auxiliary Building HVAC Turbine Building Ventilation	Section 2.3.3.4, Miscellaneous Heating, Ventilating and Air Conditioning Systems Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems Section 2.3.3.6, Control Building HVAC Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
032, 033	Controlled Air and Service Air	Section 2.3.3.7, Compressed Air
034	Vacuum Priming	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
035	Generator Cooling	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
036	Feedwater Secondary Treatment	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
037	Gland Seal Water	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
40, 305	Station Drainage and Sewage	Section 2.3.3.8, Station Drainage
041	Layup Water Treatment	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
043	Sampling and Water Quality	Section 2.3.3.9, Sampling and Water Quality
047	Turbogenerator Control	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
050	Hypochlorite	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
054	Injection Water	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
059, 959	Demineralized Water and Cask Decon, and Demineralized Water Storage and Distribution	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
061	Ice Condenser	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
062	Chemical and Volume Control	Section 2.3.3.10, Chemical and Volume Control

System Code	System Name	Section Describing System
065	Emergency Gas Treatment	Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems
067	Essential Raw Cooling Water	Section 2.3.3.11, Essential Raw Cooling Water
070	Component Cooling	Section 2.3.3.12, Component Cooling
077	Waste Disposal	Section 2.3.3.13, Waste Disposal
078	Spent Fuel Pit Cooling	Section 2.3.3.14, Spent Fuel Pit Cooling
081	Primary Water Makeup	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
082	Standby Diesel Generator	Section 2.3.3.15, Standby Diesel Generator
087	Upper Head Injection	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
090	Radiation Monitoring	Section 2.3.3.17, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

System Description

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 other intended functions are noted in the descriptions below with a reference to the section where the affected components are evaluated (e.g., Section 2.3.2.4, Containment Penetrations for primary containment penetrations).

Auxiliary Boiler

The purpose of the auxiliary boiler system (system code 012) is to distribute auxiliary steam for various uses and to provide a source of steam during plant startup. The system distributes steam provided by the extraction steam system during normal operation and steam generated by the auxiliary boilers during startup and shutdown operations. The system provides steam to the building heating system heat exchangers when required, and to the main turbine and main feedwater pump turbine gland seals during startup or shutdown conditions when main and extraction steam are unavailable.

The system includes the auxiliary boilers and their supporting equipment, such as pumps, deaerator, piping, valves, instruments and controls. The building heating system heat exchangers and the distribution piping, valves, instruments and controls to the system loads are also included in the system.

The system originally supplied steam to components in the auxiliary building, but most of the system has been abandoned. The steam supply line at the turbine building to auxiliary building penetration has been isolated by blind flanges. The nonsafety-related blind flange and piping inside the auxiliary building forms part of the auxiliary building secondary containment envelope (ABSCE).

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

- Support containment pressure boundary (ABSCE).

Components that support containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations.

UFSAR Reference: None

Central Lubricating Oil

The purpose of the central lubricating oil system (system code 020) is to provide lube oil services for the main turbine and main feedwater pump turbines (MFPT). The system provides lube oil storage, transfer, filtration, purification and cooling. The system includes main turbine and MFPT oil tanks, oil coolers, pumps, filters, purifiers, piping, valves, instruments and controls.

UFSAR Reference: None

Raw Cooling Water

The purpose of the raw cooling water system (system code 24) is to remove heat from the nonsafety-related equipment it serves. The raw cooling water system furnishes cooling water to various steam and power conversion equipment heat loads in the turbine building, non-essential room coolers in the auxiliary building, ice condenser package chillers in the additional equipment building, and other miscellaneous equipment.

The system consists of five raw cooling water pumps and two booster pumps, four raw cooling water strainers and various component supply strainers, and associated valves and piping. The raw cooling water strainers and pumps are located in the turbine building. River water from both condenser circulating water intake conduits is supplied to the strainers through a manifold common to Units 1 and 2. All raw cooling water pumps discharge into a common loop header in the turbine building for distribution to the various heat loads of both units.

UFSAR Reference: Section 9.2.7

Raw Service Water

The purpose of the raw service water system (system code 025) is to provide a source of raw water for various nonsafety-related uses. The system provides cooling water to ventilation coolers in the service building, supplies water to the makeup water treatment facility, and provides water for general purpose uses at various locations around the plant.

The system includes four raw service water pumps, two raw service water storage tanks located on the auxiliary building roof, and distribution piping and valves. Water from the raw cooling water strainer header supplies the raw service water pumps.

UFSAR Reference: None

Water Treatment System and Makeup Water Treatment Plant

The purpose of the water treatment system and makeup water treatment plant (system code 028, 928) is to provide treated water of suitable quality for use in plant systems. Portions of two treatment systems service the plant. The original water treatment facility is housed within the turbine building and a newer water treatment facility is housed within a separate building located in the yard. Most components of the original system have been abandoned; the remaining components distribute treated water to miscellaneous components. The newer facility, which is vendor controlled and operated, supplies water to the demineralized water system.

UFSAR Reference: Section 9.2.3.2

Potable (Treated) Water Distribution

The purpose of the potable (treated) water distribution system (system code 029) is to distribute treated water to facilities around the plant, primarily for use by personnel. Potable water is supplied by the Hixson Utility District. The potable water supply flows by utility pressure to two 10,000-gallon storage tanks in the turbine building. The yard distribution system conveys potable water to the various buildings and to other points of usage. Most fixtures are supplied from a return line from the storage tanks to prevent depleting the chloride residual in the tanks. Other fixtures which are remote from the return line are supplied by the supply line to the storage tanks. There are no potable water lines in the reactor building.

UFSAR Reference: Section 9.2.4.1

Vacuum Priming

The purpose of the vacuum priming system (system code 034) is to ensure the circulating water side of the main condenser is maintained full to maximize condenser cooling. The system is used to remove air from the condenser water boxes during condenser circulating water system startup. The system includes two vacuum pumps, a vacuum priming tank, piping, valves, instruments and controls.

UFSAR Reference: Section 10.4.5.2

Generator Cooling

The purpose of the generator cooling system (system code 035) is to remove heat from the main generator during normal operation. The system also establishes and maintains the hydrogen environment inside the generator to minimize friction losses and promote rotor cooling.

The system removes heat from the stator coils using a closed cooling water system consisting of heat exchanger piping embedded in the stator, a stator cooling water storage tank, pumps, heat exchangers, demineralizers, piping, valves, instruments and controls. The raw cooling water system provides cooling to the heat exchangers.

The system includes the hydrogen trailers and the hydrogen distribution system supplying the generators, and the piping, valves, instruments and controls used to maintain the hydrogen environment within the generator. The system also includes the generator seal oil system that isolates the hydrogen environment from the outside air. Carbon dioxide from the CO2 storage, fire protection and purging system is used as a purge gas when the generator is opened for maintenance or closed for operation.

UFSAR Reference: None

Feedwater Secondary Treatment

The purpose of the feedwater secondary treatment system (system code 036) is to provide the means to inject chemicals into the secondary system to scavenge oxygen and maintain proper pH of the condensate and feedwater. The system can inject chemicals such as ammonia, hydrazine and boric acid at various points in the secondary system such as the hotwell pump discharge, the condensate polisher discharge, the steam generator wet layup recirculation lines, and the auxiliary boiler feedwater pump suction. The system includes chemical mixing and storage tanks, injection pumps, piping, valves, instruments and controls.

UFSAR Reference: None

Gland Seal Water

The purpose of the gland seal water system (system code 037) is to provide water to various equipment seals. The system provides seal water to the condenser vacuum pumps, auxiliary boiler feedwater pumps and the condenser vacuum breaker water seal. The system includes a gland seal storage tank (one per unit), and distribution piping and valves, instruments and controls. The system distributes water to the seals by gravity flow from the storage tank. The tank water level is maintained by water from the hotwell pump discharge.

UFSAR Reference: None

Layup Water Treatment

The purpose of the layup water treatment system (system code 041) is to support the wet layup of the steam generators. The system uses separate recirculation pumps, one per generator, to recirculate the steam generators during layup. The pumps are in normally isolated lines between the steam generator blowdown lines and the main feedwater lines. The system also includes normally disconnected lines that can be used to fill and drain the steam generators. The system code includes a layup water holdup tank that is now used to mix and hold borated water for use during refueling. The system includes no safety-related components.

The system includes valves that are part of an alternate isolation boundary in the event a blowdown containment isolation valve fails close. The isolation boundary supports safe shutdown operation of the auxiliary feedwater pump turbine.

In addition to the 10 CFR 54.4(a)(2) function described above, the layup water treatment system has the following intended function for 10 CFR 54.4(a)(3).

- Provide steam to the auxiliary feedwater pump turbines and motive power to the associated auxiliary feedwater pumps for an Appendix R event (10 CFR 50.48) (part of system isolation boundary when using valves downstream of the blowdown containment isolation valves in case of a failure of these valves to close).

Components of the system supporting safe shutdown operation of the auxiliary feedwater pump turbine are reviewed in Section 2.3.4.1, Main Steam.

UFSAR Reference: None

Turbine Building Ventilation

The purpose of the turbine building heating, cooling, and ventilating systems is to maintain an acceptable building environment for the protection of plant equipment and controls and for the comfort and safety of personnel. These systems (primarily system codes 030, 044, 300 and 440) have no safety function.

Turbine building ventilation is provided by two main systems, one serving the area above the turbine room floor and the other serving the area below. Both main ventilation systems use supply and exhaust fans to circulate outside air through the ventilated spaces. Ventilation is also provided to lube oil rooms by separate exhaust fans. Raw water cooled fan-coil cooling units supplement the turbine building ventilation systems during peak cooling load conditions.

The turbine building is heated by unit and hot water space heaters located throughout the building. The building heating system is a medium-temperature hot water, closed, forced water loop. The heating system includes two water circulating pumps, two steam to water heat exchangers, tanks, heating coils, space and unit heaters, controls, and supply and return water distribution piping. Heating steam for the building heating system heat exchanger is supplied by the auxiliary boiler system, which uses extraction steam during normal operation. The building heating system also supplies containment purge air supply preheaters and the auxiliary building air inlet heating/cooling coils.

UFSAR Reference: Section 9.4.4

Turbogenerator Control

The purpose of the turbogenerator control system (system code 047) is to provide support services for the operation of the main turbine. Components of the system provide control of the main stop, governing, intercept, and reheat stop valves; support the operation of the turbine gland seals; and monitor operation of the main turbine.

The turbine uses an electrohydraulic control system for control of both speed and load. The system is composed of solid-state electronic devices coupled through electrohydraulic transducers to a high-pressure hydraulic fluid system. Major mechanical elements of the control system are part of the turbine. The turbogenerator control system provides pumps, tanks, filters, piping, and valves to support the system hydraulics.

The turbine gland sealing system provides sealing steam to labyrinth type seals for the main turbine shafts and valve stems. The turbogenerator control system provides piping and valves to support the gland sealing system.

The turbogenerator control system also provides instrumentation used to monitor turbine operation. The system includes safety-related electrical position switches to provide turbine trip indication to the reactor protection system. The system includes no safety-related mechanical components.

UFSAR Reference: Section 10.2.2, Section 10.4.3

Hypochlorite

The primary function of the hypochlorite (or raw water chemical treatment) system (system code 050) is to remove existing corrosion products, reduce corrosion rates, and reduce biological fouling in raw water systems. Removing existing corrosion products in raw water systems will help ensure sufficient flow through pipes and components. The corrosion inhibitors help maintain lowered corrosion rates and prevent future flow restrictions from an accumulation of corrosion products. Chemicals are periodically injected into the raw water system to control organic fouling, including slime; minimize the effect of microbiologically induced corrosion (MIC); and inhibit the growth of Asiatic clams and zebra mussels.

The system includes chemical and biocide treatment equipment in vendor-supplied skids and the piping and valves supplying the raw water cooling and essential raw water cooling systems. The system also includes isolation valves at the boundary between abandoned system piping and other raw water systems, including the condenser circulating water and high pressure fire protection systems. The system includes isolation valves that are part of the safety-related pressure boundary of the supplies to the essential raw water cooling and high pressure fire protection systems.

In addition to the 10 CFR 54.4(a)(2) function described above, the hypochlorite system has the following intended function for 10 CFR 54.4(a)(1).

- Support safety-related pressure boundary of essential raw water cooling and high pressure fire protection systems.

The components that support the pressure boundaries of supplied systems are reviewed with the supplied systems in Section 2.3.3.2, High Pressure Fire Protection, and Section 2.3.3.11, Essential Raw Cooling Water.

UFSAR Reference: None

Injection Water

The purpose of the injection water system (system code 054) is to provide sealing water to secondary system pumps. Water from the hotwell pump discharge is used for seal injection for heater drain tank pumps and condensate booster pumps. Injection pumps provide higher pressure seal injection for the feedwater pumps. The system includes the injection pumps, filters, piping, valves, instruments and controls.

UFSAR Reference: None

Demineralized Water

The purpose of the demineralized water systems is to supply high purity water for makeup to the steam generators and the primary water system, for cask decontamination, and for cleaning, flushing, and makeup for miscellaneous services. The demineralized water systems include the demineralized water and cask decontamination system (system code 059), and the demineralized water storage and distribution system (system code 959).

The demineralized water systems are supplied by the vendor-supplied demineralized water makeup system located in the yard south of the turbine building. The demineralized water system which stores and distributes the demineralized water consists of a 10,000-gallon demineralized water tank, a 500,000-gallon demineralized water storage tank, a 15,000-gallon cask decontamination tank, main piping loop, pumps, and headers and valves. The loop supplies water for various services. The system includes components that support containment isolation and form part of the pressure boundary of the condensate storage tank (CST) water supply to the auxiliary feedwater pumps during station blackout or for safe shutdown following a fire.

In addition to the 10 CFR 54.4(a)(2) function listed above, the demineralized water systems have the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

The demineralized water systems also have the following intended function for 10 CFR 54.4(a)(3).

- Perform a function that demonstrates compliance with the Commission's regulations for safe shutdown (10 CFR 50.48) and station blackout (10 CFR 50.63) by supporting the CST pressure boundary.

Components of the system supporting the containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations. Components of the system supporting the CST pressure boundary are reviewed in Section 2.3.4.2, Main and Auxiliary Feedwater.

UFSAR Reference: Section 9.2.3

Ice Condenser

The purpose of the ice condenser system (system code 061) is to support containment energy removal and pressure suppression for a LOCA or HELB event. The system contains about two million pounds of ice located in 1,944 baskets. The ice contains sodium tetraborate needed for pH control and maintenance of the boron concentration required for iodine removal during a LOCA.

The ice condenser system is comprised primarily of structural components used to support and contain the ice. Mechanical components are used for the refrigeration system which cools and maintains the temperature in the ice condenser and provides the coolant supply for the ice machines during ice loading. Cooling of the ice condenser is achieved by a three-stage system including a refrigerant loop, glycol loop and air cooling loop. The refrigerant loop and portions of the glycol loop are common equipment, serving both units. The refrigeration system is not required to remove heat following a design basis event.

The refrigerant loop uses ten 25-ton chiller units. Each unit is a closed refrigeration system consisting of a compressor, a condenser, expansion valves, evaporator, and related controls and accessories. Ethylene glycol solution is cooled during its passage through the evaporator, and heat is removed from the chiller unit by cooling water flowing through the condenser. The condenser cooling water is provided from the non-essential raw service water system.

The glycol (corrosion inhibited 50% ethylene glycol solution) loop carries the heat removed from the ice condenser air handling units, the floor cooling system and the ice machines (when operating) to the refrigerant cycle evaporator/cooler units. Glycol circulating pumps convey the cooled glycol from the refrigeration units to the air handling units (30 per containment) and to the ice compartment floor cooling system of each containment. The heated glycol is then returned to the refrigeration units outside containment. The glycol supply and return lines include containment isolation components.

The air cooling loop maintains the ice bed temperature by circulating chilled air through the compartment. Two rows of air handlers are located along inner and outer walls of the ice compartments. The heat is extracted from the air in its passage through the air handlers and from the floor cooling system.

The ice condenser system also includes mechanical components that support cooling of the lower containment during design basis events. The ice condenser compartment floor drains, consisting of piping and check valves, drain water from melted ice into the lower compartment, providing cooling of the compartment atmosphere.

In addition to the 10 CFR 54.4(a)(2) function described above, the ice condenser system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

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

- Support post-accident containment cooling.

Components that support containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations. Components that support post-accident containment cooling are reviewed in Section 2.3.3.13, Waste Disposal.

UFSAR Reference: Section 6.2.3, Section 6.5

Primary Water Makeup

The purpose of the primary water makeup system (system code 081) is to provide a source of clean water for makeup and other support of the reactor coolant system. The system includes a primary makeup water storage tank for each unit, two primary makeup water pumps per unit, piping, valves and instrumentation. The primary makeup water pumps, taking suction from the primary makeup water storage tank, are employed for various makeup and flushing operations. Normally, a primary makeup water pump runs continuously and provides flow to the boric acid blender as needed. The system also provides water to the spray nozzles of the pressurizer relief tank. The system includes containment isolation components for the lines entering containment and provides water to the reactor coolant pump seal stand pipes through safety-related piping components.

In addition to the 10 CFR 54.4(a)(2) function described above, the primary water makeup system has the following intended functions for 10 CFR 54.4(a)(1).

- Support reactor coolant pump seal stand pipe operation.
- Support containment pressure boundary.

Components that support containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations. Components that support RCP seal standpipe operation are reviewed in Section 2.3.3.10, Chemical and Volume Control.

UFSAR Reference: Section 9.2.3, Section 9.3.4.2.2

Upper Head Injection

The original purpose of the upper head injection system (system code 087) was to provide an additional source of water for post-accident core cooling. The system was removed from service (Cycle 4 for both units) by cutting and capping system piping to isolate unused portions of the system. The components that remain in service (nozzles in the reactor vessel head and containment penetrations) have been reassigned to different system codes. The remaining isolated portion of the system is abandoned in place, but may contain water in sections of the piping.

UFSAR Reference: Section 5.4.2

Radiation Monitoring

The purpose of the radiation monitoring system (system code 090) is to detect abnormal conditions that could result in release of radioactivity to the environment beyond prescribed limits, or high radioactivity levels in the plant. The system consists of approximately 90 monitors strategically installed throughout the plant. The system provides continuous indication, alarm, and recording in the main control room. Some subsystems have local indication and automatic protective action in the event radiation level exceeds pre-established limits.

The radiation monitoring system uses various types of monitors to measure process, effluent, area and airborne radiation levels. The monitors used for most applications employ only electrical components. These include on-line monitors that detect liquid or gaseous radioactivity by measuring dose rates in the vicinity of the piping or duct, and area radiation monitors.

For other monitors, the system uses mechanical components that form part of the pressure boundary of the monitored liquid or gas system. For example, off-line monitors divert a portion of the liquid or gas from a pipe or duct to provide a sample for measurement. For such monitors, the mechanical components may be safety-related to support a safety function of the radiation monitor, or components may be safety-related only as part of the pressure boundary of a safety-related system. Where the monitor flow path penetrates containment, the mechanical components may also be safety-related as part of the containment pressure boundary.

For SQN, the radiation monitors that rely on mechanical components to perform a safety function are as follows:

- Containment building purge air exhaust monitors which isolate containment atmosphere discharges through the shield building vent.
- Main control room air intake monitors which transfer the main control room ventilation from normal to emergency mode.

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 the safety function of the containment building purge air exhaust and main control room air intake monitors.
- Support the pressure boundary of monitored safety-related systems.
- Support containment pressure boundary.

Components that support radiation monitor safety functions or support the pressure boundaries of safety-related systems are reviewed with the system monitored: Section 2.3.3.11, Essential Raw Cooling Water; Section 2.3.3.5, Auxiliary Building and Reactor Building Gas Treatment and Ventilation Systems; and Section 2.3.3.6, Control Building HVAC. Components that support containment pressure boundary are reviewed in Section 2.3.2.4, Containment Penetrations.

UFSAR Reference: Section 11.4, Section 12.2.4

UFSAR References

The following table lists the UFSAR references for systems described in this section.

System Code	System	UFSAR Reference
012	Auxiliary Boiler	None
020	Central Lubricating Oil	None
024	Raw Cooling Water	Section 9.2.7
025	Raw Service Water	None
028, 928	Water Treatment System and Makeup Water Treatment Plant	Section 9.2.3.2
029	Potable (Treated) Water Distribution	Section 9.2.4.1
034	Vacuum Priming	Section 10.4.5.2
035	Generator Cooling	None
036	Feedwater Secondary Treatment	None
037	Gland Seal Water	None
041	Layup Water Treatment	None
044, 440	Turbine Building Ventilation	Section 9.4.4
047	Turbogenerator Control	Section 10.2.2, Section 10.4.3
050	Hypochlorite	None
054	Injection Water	None
059, 959	Demineralized Water	Section 9.2.3
061	Ice Condenser	Section 6.2.3, Section 6.5
081	Primary Water Makeup	Section 9.2.3, Section 9.3.4.2.2
087	Upper Head Injection	Section 5.4.2
090	Radiation Monitoring	Section 11.4, Section 12.2.4

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 base-mounted component, flexible connection, or the end of a piping run (such as a vent or drain line).

(4) A boundary supported by design documents, such as piping stress analyses.

(5) A point where buried piping exits the ground.

For spatial interaction, auxiliary system components containing oil, steam, or liquid and located in spaces containing safety-related equipment are subject to aging management 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.

Series 2.3.3-17-xx 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 3.3.2-17-xx 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
012	Auxiliary Boiler	Table 2.3.3-17-1	Table 3.3.2-17-1
018	Fuel Oil	Table 2.3.3-17-2	Table 3.3.2-17-2
020	Central Lubricating Oil	Table 2.3.3-17-3	Table 3.3.2-17-3

System Code	System Name	Component Types	AMR Results
024	Raw Cooling Water	Table 2.3.3-17-4	Table 3.3.2-17-4
025	Raw Service Water	Table 2.3.3-17-5	Table 3.3.2-17-5
026	High Pressure Fire Protection	Table 2.3.3-17-6	Table 3.3.2-17-6
028, 928	Water Treatment System and Makeup Water Treatment Plant	Table 2.3.3-17-7	Table 3.3.2-17-7
029	Potable (Treated) Water Distribution	Table 2.3.3-17-8	Table 3.3.2-17-8
030, 300 31A, 311 31C, 313 044, 440	Containment and Diesel Generator HVAC; Control Building HVAC; Auxiliary Building HVAC Turbine Building HVAC	Table 2.3.3-17-9	Table 3.3.2-17-9
032, 033	Controlled Air and Service Air	Table 2.3.3-17-10	Table 3.3.2-17-10
034	Vacuum Priming	Table 2.3.3-17-11	Table 3.3.2-17-11
035	Generator Cooling	Table 2.3.3-17-12	Table 3.3.2-17-12
036	Feedwater Secondary Treatment	Table 2.3.3-17-13	Table 3.3.2-17-13
037	Gland Seal Water	Table 2.3.3-17-14	Table 3.3.2-17-14
40, 305	Station Drainage and Sewage	Table 2.3.3-17-15	Table 3.3.2-17-15
041	Layup Water Treatment	Table 2.3.3-17-16	Table 3.3.2-17-16
043	Sampling and Water Quality	Table 2.3.3-17-17	Table 3.3.2-17-17
047	Turbogenerator Control	Table 2.3.3-17-18	Table 3.3.2-17-18
050	Hypochlorite	Table 2.3.3-17-19	Table 3.3.2-17-19
054	Injection Water	Table 2.3.3-17-20	Table 3.3.2-17-20
059, 959	Demineralized Water and Cask Decon, and Demineralized Water Storage and Distribution	Table 2.3.3-17-21	Table 3.3.2-17-21
061	Ice Condenser	Table 2.3.3-17-22	Table 3.3.2-17-22
062	Chemical and Volume Control	Table 2.3.3-17-23	Table 3.3.2-17-23
065	Emergency Gas Treatment	Table 2.3.3-17-24	Table 3.3.2-17-24
067	Essential Raw Cooling Water	Table 2.3.3-17-25	Table 3.3.2-17-25

System Code	System Name	Component Types	AMR Results
070	Component Cooling	Table 2.3.3-17-26	Table 3.3.2-17-26
077	Waste Disposal	Table 2.3.3-17-27	Table 3.3.2-17-27
078	Spent Fuel Pit Cooling	Table 2.3.3-17-28	Table 3.3.2-17-28
081	Primary Water Makeup	Table 2.3.3-17-29	Table 3.3.2-17-29
082	Standby Diesel Generator	Table 2.3.3-17-30	Table 3.3.2-17-30
087	Upper Head Injection	Table 2.3.3-17-31	Table 3.3.2-17-31
090	Radiation Monitoring	Table 2.3.3-17-32	Table 3.3.2-17-32

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
012	Auxiliary Boiler	LRA-1,2-47W815-1 LRA-1,2-47W815-2 LRA-1,2-47W840-1
018	Fuel Oil	LRA-1,2-47W840-1
020	Central Lubricating Oil	LRA-1-47W807-1 LRA-2-47W807-1 LRA-1,2-47W816-1
024	Raw Cooling Water	LRA-1-47W844-1 LRA-1-47W844-2 LRA-1-47W844-3 LRA-2-47W844-1 LRA-2-47W844-2 LRA-2-47W844-3 LRA-1,2-47W844-4 LRA-1,2-47W844-5 LRA-1-47W849-3 LRA-2-47W849-3 LRA-1,2-47W816-1
025	Raw Service Water	LRA-1,2-47W832-6 LRA-1,2-47W832-8 LRA-1,2-47W850-26

System Code	System Name	LRA Drawings	
026	High Pressure Fire Protection	LRA-1,2-47W850-1 LRA-1,2-47W850-2 LRA-1,2-47W850-6 LRA-1,2-47W850-7 LRA-1,2-47W850-8 LRA-1,2-47W850-9	LRA-1,2-47W850-10 LRA-1,2-47W850-11 LRA-1,2-47W850-20 LRA-1,2-47W850-21 LRA-1,2-47W850-24
028, 928	Water Treatment System and Makeup Water Treatment Plant	LRA-1,2-47W834-1 LRA-1,2-47W834-2	LRA-1,2-47W834-3 LRA-1,2-47E871-2
029	Potable (Treated) Water Distribution	LRA-1,2-47W835-1 LRA-1,2-47W835-2 LRA-1,2-47W835-4	
030, 300 31A, 311 31C, 313 044, 440	Containment and Diesel Generator HVAC Control Building HVAC Auxiliary Building HVAC Turbine Building HVAC	LRA-1,2-47W852-2 LRA-1,2-47W865-1 LRA-2-47W865-2 LRA-1,2-47W865-3 LRA-1,2-47W865-5 LRA-1,2-47W865-7 LRA-1,2-47W865-8 LRA-1,2-47W865-9 LRA-1-47W866-1	LRA-2-47W866-1 LRA-1,2-47W866-2 LRA-1,2-47W866-4 LRA-1,2-47W866-8 LRA-1,2-47W866-9 LRA-1,2-47W866-10 LRA-1,2-47W866-11 LRA-1,2-47W866-15
032, 033	Controlled Air and Service Air	LRA-1,2-47W840-1 LRA-1,2-47W846-1 LRA-1,2-47W846-2	LRA-1,2-47W848-1 LRA-1-47W848-11 LRA-2-47W848-13
034	Vacuum Priming	LRA-1,2-47W858-1	
035	Generator Cooling	LRA-1,2-47W849-1 LRA-1,2-47W849-2	LRA-1-47W849-3 LRA-2-47W849-3
036	Feedwater Secondary Treatment	LRA-1,2-47W854-1 LRA-1,2-47W854-2	
037	Gland Seal Water	LRA-1-47W841-1 LRA-2-47W841-1	
040, 305	Station Drainage and Sewage	LRA-1,2-47W851-1 LRA-1,2-47W852-3 LRA-1,2-47W852-4 LRA-1,2-47W852-5 LRA-1,2-47W852-6 LRA-1,2-47W853-1	LRA-1,2-47W853-2 LRA-1,2-47W853-3 LRA-1,2-47W853-4 LRA-1,2-47W853-5 LRA-1,2-47W853-6 LRA-1,2-47W853-11

System Code	System Name	LRA Drawings	
041	Layup Water Treatment	LRA-1,2-47W862-1 LRA-1,2-47W862-2	
043	Sampling and Water Quality	LRA-1,2-57521 LRA-1,2-57523 LRA-1-47W859-2 LRA-1-47W881-1 LRA-2-47W881-1 LRA-1,2-47W881-2 LRA-1,2-47W881-3 LRA-1,2-47W881-5	LRA-1,2-47W881-5-1 LRA-1-47W881-6 LRA-2-47W881-6 LRA-1,2-47W881-7 LRA-1,2-47W881-8 LRA-1,2-47W881-9 LRA-1,2-47W881-10
047	Turbogenerator Control	LRA-1,2-47W801-1 LRA-1-47W807-1	LRA-2-47W807-1 LRA-1,2-47W807-2
050	Hypochlorite	LRA-1,2-47W860-1	
054	Injection Water	LRA-1,2-47W803-1	
059, 959	Demineralized Water and Cask Decon, and Demineralized Water Storage and Distribution	LRA-1,2-47W856-1 LRA-1,2-47W856-2	
061	Ice Condenser	LRA-1,2-47W814-1 LRA-1,2-47W814-2 LRA-1,2-47W814-3	
062	Chemical and Volume Control	LRA-1-47W809-1 LRA-2-47W809-1 LRA-1,2-47W809-2 LRA-1,2-47W809-3	LRA-1,2-47W809-4 LRA-1,2-47W809-5 LRA-1,2-47W809-6
065	Emergency Gas Treatment	LRA-1-47W866-1 LRA-2-47W866-1 LRA-1,2-47W852-2	
067	Essential Raw Cooling Water	LRA-1,2-47W845-1 LRA-1,2-47W845-2 LRA-1,2-47W845-5 LRA-1-47W845-3	LRA-1-47W845-6 LRA-2-47W845-3 LRA-2-47W845-4
070	Component Cooling	LRA-1,2-47W859-1 LRA-1-47W859-2	LRA-2-47W859-3 LRA-1,2-57521

System Code	System Name	LRA Drawings	
077	Waste Disposal	LRA-1,2-47W830-1 LRA-1,2-47W830-2 LRA-1,2-47W830-3 LRA-1,2-47W830-4 LRA-1,2-47W830-5 LRA-1,2-47W830-6 LRA-1,2-47W830-7	LRA-1,2-47W851-1 LRA-1,2 47W852-1 LRA-1,2 47W852-2 LRA-1,2 47W852-3 LRA-1,2 47W852-4 LRA-1,2 47W852-5 LRA-1,2 47W852-6
078	Spent Fuel Pit Cooling	LRA-1,2-47W855-1	
081	Primary Water Makeup	LRA-1,2-47W819-1	
082	Standby Diesel Generator	LRA-1,2-47W839-1	
087	Upper Head Injection	LRA-1-47W811-2 LRA-2-47W811-2	
090	Radiation Monitoring	LRA-1,2-47W809-4 LRA-1-47W844-3 LRA-2-47W844-3	LRA-1-47W866-1 LRA-2-47W866-1

Table 2.3.3-17-1
Auxiliary Boiler System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Deaerator	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	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
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-2
Fuel Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-3
Central Lubricating Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Blower housing	Pressure boundary
Bolting	Pressure boundary
Cooler (shell)	Pressure boundary
Filter housing	Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-4
Raw Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Cooler housing	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-5
Raw Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flex connection	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-6
High Pressure Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-7
Water Treatment System and Makeup Water Treatment Plant
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Ejector	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
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-8
Potable (Treated) Water Distribution System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-9
Heating, Ventilating and Air Conditioning Systems
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Coil	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

**Table 2.3.3-17-10
Control Air System and Service Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[a]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-11
Vacuum Priming System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flex connection	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Trap	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-12
Generator Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Cooler housing	Pressure boundary
Demineralizer	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	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
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

**Table 2.3.3-17-13
Feedwater Secondary Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[a]
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

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

Table 2.3.3-17-14
Gland Seal Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flex connection	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-15
Station Drainage System and Sewage System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	**Intended Function[a]**
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-16
Layup Water Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flex connection	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-17
Sampling and Water Quality System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Cooler housing	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (shell)	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

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

Table 2.3.3-17-18
Turbogenerator Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Accumulator	Pressure boundary
Bolting	Pressure boundary
Cooler (bonnet)	Pressure boundary
Cooler (shell)	Pressure boundary
Filter housing	Pressure boundary
Flow element	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
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-19
Hypochlorite System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-20
Injection Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-21
Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-22
Ice Condenser System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	**Intended Function[a]**
Bolting	Pressure boundary
Chiller housing	Pressure boundary
Condenser (shell)	Pressure boundary
Cooler housing	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heater housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-23
Chemical and Volume Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Condenser (shell)	Pressure boundary
Cooler housing	Pressure boundary
Demineralizer	Pressure boundary
Ejector	Pressure boundary
Evaporator	Pressure boundary
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary
Heater housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

**Table 2.3.3-17-24
Emergency Gas Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[a]
Bolting	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Fan housing	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-25
Essential Raw Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-26
Component Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Condenser (shell)	Pressure boundary
Cooler (shell)	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-27
Waste Disposal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Condenser (shell)	Pressure boundary
Cooler housing	Pressure boundary
Demineralizer	Pressure boundary
Ejector	Pressure boundary
Evaporator	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
Rupture disc	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-28
Spent Fuel Pit Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-29
Primary Water Makeup System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-30
Standby Diesel Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-31
Upper Head Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Piping	Pressure boundary
Rupture disc	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.3-17-32
Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

2.3.4 Steam and Power Conversion Systems

The following systems are included in this section.

- Section 2.3.4.1, Main Steam
- Section 2.3.4.2, Main and Auxiliary Feedwater
- Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

2.3.4.1 Main Steam

System Description

The main steam system code (001) includes the main steam piping and components from the outlets of the steam generators up to and including the main turbine, feedwater pump turbines, auxiliary feedwater pump turbines, main turbine second stage reheaters, and turbine bypass valves. The purpose of the main steam (MS) system is to conduct steam from the steam generator outlets to the turbine, which converts thermal energy of the steam to mechanical energy used to drive the main generator. The MS system supplies steam to the feedwater pump turbines and auxiliary feedwater pump turbines, which provide power to their respective feedwater pumps, and to the main turbine second stage reheaters, which dry and reheat high pressure turbine exhaust steam for use by the low pressure turbines. The MS system also includes piping and components from the steam generators to the steam generator blowdown system.

The steam flows from each of four steam generators (part of the reactor coolant system code) through containment and the main steam line isolation valves (MSIVs). Each steam supply includes a flow restrictor, which will act to limit the maximum flow and the resulting thrust force created by a steam line break. The flow restrictor is a flow limiter incorporated into the main steam nozzle of the replacement steam generators.

The steam generator safety valves and atmospheric relief valves are located upstream of the MSIVs. There are five safety valves per steam generator. The steam generator safety valves provide emergency pressure relief for the steam generators in the event that steam generation exceeds steam consumption. There is one atmospheric relief valve per steam generator. The atmospheric relief valves provide the means for plant cooldown and steam generator pressure control by steam discharge to the atmosphere if the turbine bypass valves are not available.

The MSIVs and MSIV bypass valves are provided to protect the plant during accident conditions, such as main steam line breaks and steam generator tube ruptures. The MSIVs and MSIV bypass valves are fail-closed, air-operated valves located in the main steam line downstream of the main steam safety valves and atmospheric relief valves.

The turbine consists of a double-flow high-pressure turbine and three double-flow low-pressure turbines with extraction nozzles arranged for seven stages of feedwater heating. Exhaust steam from the high-pressure unit passes through six moisture separator/reheaters before entering the low-pressure turbines. The moisture separator/reheaters are shell and tube-type heat exchangers containing a section of chevron vanes for moisture separation.

The MS system also supplies steam to the main feedwater pump turbines and auxiliary feedwater pump turbines. The turbines, which are included in the MS system code, provide motive power to their respective feedwater pumps.

The steam lines from the four steam generators are cross-connected immediately upstream of the turbine stop valves. Piping is run from this header to the turbine bypass valves and then to the triple-shell condenser. Each of the three condenser shells will receive the discharge from four turbine bypass valves.

The steam generator blowdown lines, from the steam generators out to and including the outboard containment isolation valves, are also part of the main steam system. These safety-related components support the containment pressure boundary.

Steam traps are provided on the main steam line drains upstream of the MSIVs. The steam traps can be aligned to remove condensed steam during flood mode (natural flood above plant grade) operations.

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

- Provide steam generator overpressure protection.
- Limit steam release and provide secondary side isolation capability to limit RCS cooldown following a steam line rupture.
- Provide isolation capability during a steam generator tube rupture.
- Provide steam generator pressure control and decay heat removal via steam discharge to atmosphere.
- Support containment pressure boundary.
- Provide steam to the auxiliary feedwater pump turbines and motive power to the associated auxiliary feedwater pumps to ensure decay heat removal.

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

- Provide main steam line condensation removal in the event of a natural flood above plant grade.
- 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).

- Provide capability to cool down RCS via steam discharge to atmosphere for the Appendix R event (10 CFR 50.48) or for station blackout (10 CFR 50.63).
- Provide steam to the auxiliary feedwater pump turbines and motive power to the associated auxiliary feedwater pumps during a station blackout (10 CFR 50.63).

- Provide steam to the auxiliary feedwater pump turbines and motive power to the associated auxiliary feedwater pumps for an Appendix R event (10 CFR 50.48) (includes system isolation using valves downstream of the MSIVs and blowdown containment isolation valves in case of a failure of these valves to close).

UFSAR References

Section 10.2

Section 10.3

Section 10.4

Section 15.2.9

Components Subject to Aging Management Review

Nonsafety-related components of the MS system not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.4.3, Miscellaneous 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-1,2-47W801-1	LRA-1,2-47W803-3
LRA-1,2-47W801-2	LRA-1,2-47W862-2
LRA-1,2-47W803-2	LRA-1,2-47W848-12

Table 2.3.4-1
Main Steam System
Components Subject to Aging Management Review

Component Type	Intended Function
Bearing housing	Pressure boundary
Bolting	Pressure boundary
Ejector	Pressure boundary
Flex connection	Pressure boundary
Flow element	Pressure boundary Flow control
Nozzle	Flow control
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

2.3.4.2 Main and Auxiliary Feedwater

System Description

This review includes the main and auxiliary feedwater system (system code 003) and the condensate system (system code 002).

Main and Auxiliary Feedwater

The purpose of the main and auxiliary feedwater system is to supply feedwater to the steam generator secondary side inlets during all operating conditions. The main feedwater system delivers feedwater to the steam generators to remove primary system energy during normal operation. The auxiliary feedwater (AFW) system supplies feedwater to the steam generators in the event of a loss of the main feedwater supply. System code 003 includes components of both the main feedwater system and auxiliary feedwater system.

The main feedwater system includes components and piping from the main feedwater pumps to the inlet of the steam generators. The steam generators are part of the reactor coolant system. The two main feedwater pumps, supplied by the condensate system, discharge to a common header which delivers flow to the final stage of feedwater heaters. From the feedwater heaters, flow returns to a common header. The common header divides to supply the four flow control valves, flow isolation valves and feedwater check valves. Flow then passes through containment to the inlet of each steam generator. The flow isolation valves and the piping and components up to the steam generator inlets are safety-related. The flow connection from the auxiliary feedwater system is in the safety-related piping between the feedwater check valves and the steam generator inlets. The system also includes piping and valves supporting steam generator level instrumentation and safety-related solenoid valves that close the nonsafety-related feedwater control valves when feedwater flow must be isolated from the steam generators.

The auxiliary feedwater system includes components and piping from the pump suction water sources to the connection to the feedwater line feeding each steam generator. The AFW system for each unit has two motor-driven pumps and one turbine-driven pump. Each of the motor-driven pumps serves two steam generators; the turbine-driven pump serves all four. The preferred sources of water for all auxiliary feedwater pumps are the two non-seismic condensate storage tanks (CSTs) which supply the AFW pumps for both units through a common supply line. A safety-grade backup water supply is available from the ERCW system, which can supply each electric pump from a separate header and the turbine pump from either ERCW header. The auxiliary feedpump turbines are part of the main steam system (system code 001), while the exhaust and drain piping and components supporting the turbines are included in this system.

The AFW system piping downstream of each motor-driven pump includes a blanked flange to permit a spool piece connection to the fire protection system. In the unlikely event of a flood above plant grade, the connection to the fire protection system can be completed to supply unlimited raw water directly to the steam generators.

The main and auxiliary feedwater system has the following intended functions for 10 CFR 54.4(a)(1).

- Provide auxiliary feedwater flow to the steam generators to ensure decay heat removal during accident conditions.
- Support isolation of main feedwater flow to the steam generators when required.
- Support containment pressure boundary.

The main and auxiliary feedwater 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 main and auxiliary feedwater system has the following intended function for 10 CFR 54.4(a)(3).

- Provide auxiliary feedwater flow to the steam generators to ensure decay heat removal for the Appendix R event (10 CFR 50.48) or for station blackout (10 CFR 50.63).

Condensate

The purpose of the condensate system (system code 002) is to transfer condensate from the condenser hotwell, to and from the condensate polishing demineralizer system, through multiple stages of feedwater heating, and to the suction of the main feedwater pumps. The system also regulates condenser hotwell level and provides the preferred (but not essential) water source for operation of the auxiliary feedwater system. The condensate system code includes the main condensers, hotwell pumps, condensate demineralizer pumps, condensate booster pumps, low and intermediate pressure feedwater heaters, CSTs, condensate transfer pumps, and related piping, valves, instruments and controls. The CSTs provide water to the auxiliary feedwater pumps following a station blackout or for safe shutdown following a fire.

In the main condensate system flowpath, condensate is taken from the main condenser hotwells by three hotwell pumps and delivered to the condensate demineralizer system. The demineralized condensate returns to the condensate demineralizer pumps in the condensate system. The water is then heated by the gland steam condenser, main feedwater pump turbine condensers, and three low pressure feedwater heater stages. The condensate booster pumps increase the system pressure and deliver the condensate to three intermediate pressure feedwater heater stages, then on to the main feedwater pumps.

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

The condensate 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 condensate 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 safe shutdown (10 CFR 50.48) and station blackout (10 CFR 50.63) by providing a source of water from the CST.

UFSAR References

Main and Auxiliary Feedwater	*Condensate*
Section 10.4.7.1	Section 10.4.7
Section 10.4.7.2	

Components Subject to Aging Management Review

Components of the main and auxiliary feedwater system supplying main steam to the main and auxiliary feedwater pump turbines are reviewed in Section 2.3.4.1, Main Steam. Nonsafety-related components of these systems not included in other reviews whose failure could prevent satisfactory accomplishment of safety functions are reviewed in Section 2.3.4.3, Miscellaneous 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-1,2-47W803-1
LRA-1,2-47W803-2
LRA-1-47W804-1
LRA-1,2-47W848-12
LRA-1,2-47W856-1

Table 2.3.4-2
Main and Auxiliary Feedwater System
Components Subject to Aging Management Review

Component Type	Intended Function
Bearing housing	Pressure boundary
Bolting	Pressure boundary
Cavitating venturi	Pressure boundary Flow control
Flex connection	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary Flow control
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

2.3.4.3 Miscellaneous 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 SQN, 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 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 oil, steam or liquid 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
001	Main Steam	Section 2.3.4.1, Main Steam
002	Condensate	Section 2.3.4.2, Main and Auxiliary Feedwater
003	Main and Auxiliary Feedwater	Section 2.3.4.2, Main and Auxiliary Feedwater
005	Extraction Steam	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
006	Heater Drains and Vents	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
007	Turbine Extraction Traps and Drains	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
014	Condensate Demineralizer	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
015	Steam Generator Blowdown	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
027	Condenser Circulating Water	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
046	Feedwater Control	Section 2.3.4.3, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

System Description

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 other intended functions are noted in the descriptions below with a reference to the section where the affected components are evaluated.

Extraction Steam

The purpose of the extraction steam system (system code 005) is to improve turbine cycle thermal efficiency by providing steam extracted from the high and low pressure turbine stages to the moisture separator reheaters and the feedwater heaters. Extraction steam from the high pressure turbine provides heat to the moisture separator reheaters and the final stage of feedwater heaters. Extraction steam from the low pressure turbines provides heat to the three low pressure feedwater heater stages. The system includes piping, valves, instruments and controls. The system serves no safety function.

UFSAR Reference: None

Heater Drains and Vents

The purpose of the heater drains and vents system (system code 006) is to remove condensed steam and non-condensable gases from secondary system equipment during all modes of unit operations. The heater drain system removes and disposes of all drainage from the moisture separators, reheaters, feedwater heaters, main feed pump turbine condensers and gland steam condensers by returning the condensed water back to the condensate and feedwater systems. The heater vent system vents all heat exchangers to the condenser to remove non-condensable gases. The system includes drain tanks, drain tank pumps, piping, valves, instruments and controls.

UFSAR Reference: Section 10.4.9

Turbine Extraction Traps and Drains

The purpose of the turbine extraction traps and drains system (system code 007) is to support the operation of various main turbine and main feedwater pump turbine equipment. The system provides drains for turbine main and cross under steam piping, main feedwater turbines, and the gland steam condenser. The system also supports the operation of the low pressure turbine exhaust hood sprays. The system includes piping, valves, instruments and controls.

UFSAR Reference: None

Condensate Demineralizer

The purpose of the condensate demineralizer system (system code 014) is to remove dissolved and suspended impurities from the secondary system. The system removes corrosion products that are carried over from the turbine, condenser, feedwater heaters, and piping. The system also removes impurities that might enter the system in the makeup water or from steam generator or condenser tube leaks.

For each unit, the condensate demineralizer system includes a battery of six mixed-bed demineralizers to polish condensate flow. The system also includes an external regeneration facility, shared between the demineralizers of the two generating units. The basic regeneration system consists of a resin separation/cation regeneration tank, anion regeneration tank, and resin storage tank. The concentrated chemicals used in regeneration are supplied from acid and caustic storage tanks. Additional equipment is provided in the regeneration system to promote efficiency in the process. A hot water tank supplies hot dilution water at the caustic mixing tee.

The demineralizers and all regeneration equipment are located within the condensate demineralizer building. The condensate demineralizer system code includes other support services for the building. The building ventilation equipment, building and equipment drains, and waste disposal equipment are part of the system code.

UFSAR Reference: Section 10.4.6

Steam Generator Blowdown

The purpose of the steam generator blowdown system (system code 015) is to support control of the solids and soluble content of the secondary coolant. Continuous blowdown is normally maintained from each steam generator during plant operation.

Each steam generator is provided with a blowdown connection. The individual blowdown lines pass though containment and join into a common header. From there the blowdown can be routed for processing or discharge through the blowdown flash tank or through the blowdown heat exchangers. Vapors from the flash tank are routed to the main condenser. Liquid from the heat exchanger path can be routed to the cooling tower blowdown for discharge or to the condensate demineralizers.

Most components of the blowdown system, including the piping inside containment and through the containment penetrations, are part of the main steam system (system code 001). The steam generator blowdown system (system code 015) includes components downstream of the common header, such as the flash tank and blowdown heat exchangers. The steam generator blowdown system includes no safety-related components.

The system includes one component that is part of an alternate isolation boundary in the event a blowdown containment isolation valve fails closed. The isolation boundary supports safe shutdown operation of the auxiliary feedwater pump turbine.

In addition to the 10 CFR 54.4(a)(2) function listed above, the steam generator blowdown system has the following intended function for 10 CFR 54.4(a)(3).

- Provide steam to the auxiliary feedwater pump turbines and motive power to the associated auxiliary feedwater pumps for an Appendix R event (10 CFR 50.48) (part of system isolation boundary when using valves downstream of the blowdown containment isolation valves in case of a failure of these valves to close).

Components of the system supporting safe shutdown operation of the auxiliary feedwater pump turbine are reviewed in Section 2.3.4.1, Main Steam.

UFSAR Reference: Section 10.4.8

Condenser Circulating Water

The purpose of the condenser circulating water (CCW) system (system code 027) is to provide cooling water to the condensers of the main steam turbines. This system also provides cooling water for auxiliary equipment and a means of rejecting waste heat from the power generation cycle into the ambient surroundings. The condenser circulating water can also be used to dilute and disperse low-level radioactive liquid wastes.

For each unit, three single-stage vertical pumps are provided in the intake pumping station to pump condenser circulating water through the condensers. Each pump is installed in a separate suction well with entering water strained by trash racks and a traveling screen. Each pump discharge is equipped with a motor-operated butterfly valve. The three pump discharge lines for each unit are brought together to a single tunnel to the condensers. Condenser discharge is routed through a single tunnel to the discharge pond. Seven cooling tower lift pumps, located in the cooling tower pumping station at the downstream end of the discharge pond, deliver water to two natural draft cooling towers. The cooling towers reject waste heat to the atmosphere to cool the condenser circulating water when river flow/temperatures will not permit direct CCW discharge to the river. An Amertap condenser tube cleaning system is provided for cleaning of condenser tubes during normal operation.

UFSAR Reference: Section 10.4.5

Feedwater Control

The purpose of the feedwater control system (system code 046) is to regulate the flow of main and auxiliary feedwater to the steam generators. Although primarily an instrumentation and control system, the feedwater control system includes mechanical hydraulic control components supporting the operation of the main feedwater pumps. These mechanical components have no safety function.

The system includes a small number of components that are part of an alternate isolation boundary in the event a main steam line isolation valve fails closed. The isolation boundary supports safe shutdown operation of the auxiliary feedwater pump turbine.

In addition to the 10 CFR 54.4(a)(2) function listed above, the feedwater control system has the following intended function for 10 CFR 54.4(a)(3).

- Provide steam to the auxiliary feedwater pump turbines and motive power to the associated auxiliary feedwater pumps for an Appendix R event (10 CFR 50.48) (includes system isolation using valves downstream of the MSIVs in case of a failure of these valves to close).

Components of the system supporting safe shutdown operation of the auxiliary feedwater pumps are reviewed in Section 2.3.4.1, Main Steam.

UFSAR Reference: Section 7.7.1.7

UFSAR References

The following table lists the UFSAR references for systems described in this section.

System Number	System	UFSAR Reference
005	Extraction Steam	None
006	Heater Drains and Vents	Section 10.4.9
007	Turbine Extraction Traps and Drains	None
014	Condensate Demineralizer	Section 10.4.6
015	Steam Generator Blowdown	Section 10.4.8
027	Condenser Circulating Water	Section 10.4.5
046	Feedwater Control	Section 7.7.1.7

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 base-mounted component, flexible connection, or the end of a piping run (such as a vent or drain line).

(4) A boundary supported by design documents, such as piping stress analyses.

(5) A point where buried piping exits the ground.

For spatial interaction, auxiliary system components containing oil, steam, or liquid 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.

Series 2.3.4-3-xx 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 3.4.2-3-xx 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
001	Main Steam	Table 2.3.4-3-1	Table 3.4.2-3-1
002	Condensate	Table 2.3.4-3-2	Table 3.4.2-3-2
003	Main and Auxiliary Feedwater	Table 2.3.4-3-3	Table 3.4.2-3-3
005	Extraction Steam	Table 2.3.4-3-4	Table 3.4.2-3-4
006	Heater Drains and Vents	Table 2.3.4-3-5	Table 3.4.2-3-5
007	Turbine Extraction Traps and Drains	Table 2.3.4-3-6	Table 3.4.2-3-6
014	Condensate Demineralizer	Table 2.3.4-3-7	Table 3.4.2-3-7
015	Steam Generator Blowdown	Table 2.3.4-3-8	Table 3.4.2-3-8
027	Condenser Circulating Water	Table 2.3.4-3-9	Table 3.4.2-3-9
046	Feedwater Control	Table 2.3.4-3-10	Table 3.4.2-3-10

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	
001	Main Steam	LRA-1,2-47W801-1	LRA-1,2-47W801-2
002	Condensate	LRA-1-47W804-1 LRA-2-47W804-1 LRA-1,2-47W804-2	LRA-1-47W841-1 LRA-2-47W841-1
003	Main and Auxiliary Feedwater	LRA-1,2-47W803-1 LRA-1,2-47W803-2	LRA-1,2-47W803-3
005	Extraction Steam	LRA-1-47W802-1	LRA-2-47W802-1
006	Heater Drains and Vents	LRA-1-47W805-1 LRA-2-47W805-1 LRA-1-47W805-2	LRA-2-47W805-2 LRA-1,2-47W805-3 LRA-1,2-47W805-4
007	Turbine Extraction Traps and Drains	LRA-1-47W807-1	LRA-2-47W807-1
014	Condensate Demineralizer	LRA-1,2-47W804-2 LRA-1-47W838-2 LRA-2-47W838-3	LRA-1,2-47W838-4 LRA-1,2-47W838-7 LRA-1,2-47W838-7-1
015	Steam Generator Blowdown	LRA-1,2-47W801-2	
027	Condenser Circulating Water	LRA-1,2-47W831-1 LRA-1-47W831-1-1 LRA-2-47W831-1-1 LRA-1-47W857-1	LRA-2-47W857-1 LRA-1,2-47W832-1 LRA-1,2-47W832-1-1 LRA-1,2-47W834-1
046	Feedwater Control	LRA-1-47W807-1 LRA-2-47W807-1	LRA-1,2-47W816-1

Table 2.3.4-3-1
Main Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Moisture separator	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Rupture disc	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-2
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Condenser (shell)	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-3
Main and Auxiliary Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Trap	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-4
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-5
Heater Drains and Vents System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Cooler (bonnet)	Pressure boundary
Cooler (shell)	Pressure boundary
Expansion joint	Pressure boundary
Flow element	Pressure boundary
Orifice	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

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

Table 2.3.4-3-6
Turbine Extraction Traps and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-7
Condensate Demineralizer System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-8
Steam Generator Blowdown System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

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

Table 2.3.4-3-9
Condenser Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Flow element	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

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

Table 2.3.4-3-10
Feedwater Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Accumulator	Pressure boundary
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vapor extractor	Pressure boundary

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

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, Water Control Structures
- Section 2.4.3, Turbine Building, Aux/Control Building and Other Structures
- Section 2.4.4, Bulk Commodities

2.4.1 Reactor Building

Description

The purpose of the SQN reactor building is to house the enclosed vital mechanical and electrical equipment, including the reactor vessel, the reactor coolant system, the steam generators, pressurizer, and auxiliary and engineered safety features systems required for safe operation and shutdown of the reactor. The reactor building also limits the release of radioactive fission products following an accident thereby limiting the dose to the public and control room operators and ensuring the leakage limits are within 10 CFR 20 guidelines during normal plant operation and 10 CFR 100 guidelines during the postulated design basis accidents.

The reactor building houses a Westinghouse 4-loop pressurized water reactor (PWR) within a free-standing steel structure, or steel containment vessel, with an ice condenser that is enclosed by a reinforced concrete shield building. The reactor building is a Category I structure and is designed to remain functional for design basis accidents. The exterior walls and dome of the shield building provide protection for the reactor vessel and all other safety-related SSCs inside the containment from missiles and natural phenomena. The major carbon steel components and the concrete inside the steel containment vessel are credited as structural heat sinks in the energy absorption analysis during a LOCA.

A more detailed description of the reactor building is provided below.

Shield Building

The shield building encloses the steel containment vessel. It is physically separated from adjoining structures by an expansion joint. The shield building is a reinforced concrete cylinder supported by a circular base slab founded on bedrock and covered at the top with a spherical dome. Conventional reinforcing steel bars were used throughout the structure. The shield building's circular concrete foundation is anchored to bedrock by a concentric pattern of reinforcing bars grouted into bedrock near the outer periphery of the slab. The slab is further keyed and anchored into rock in the central portion by the reactor cavity that extends into bedrock. The shield building is designed for design basis accidents. Additionally, the shield building provides a barrier for the annulus ventilation system, which serves as a redundant second containment barrier for control of leakage.

Steel Containment Vessel

The steel containment vessel is a low-leakage, free-standing carbon steel structure comprised of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The steel containment vessel is provided with both circumferential and vertical stiffeners on the exterior of the shell.

The base liner plate is anchored to the foundation through the use of embedded "T" sections. Welded joints in the base liner plate were made at anchors. Joints in the base liner plate are equipped with leak chases to facilitate testing for leak tightness. Major tensile loads are anchored through the base liner plate in such a manner as to prevent the liner from becoming a stress-carrying member.

The steel containment vessel consists of three separate compartments: lower compartment, the upper compartment, and the ice condenser compartment. Each compartment is identified as follows:

- The lower compartment completely encloses the reactor vessel, reactor coolant system equipment and associated auxiliary system equipment.

- The upper compartment contains the refueling canal, refueling equipment and the polar crane.

- The ice condenser compartment contains the sodium tetraborate ice. The ice condenser compartment forms a "C" around 300 degrees of the steel containment vessel outer wall between the polar crane wall and the cylindrical wall of the steel containment vessel. Steam released from the lower compartment must pass through the ice condenser compartment to reach the lower pressure upper compartment.

Major internal structures consist of reinforced concrete or steel components. Internal reinforced concrete components include the containment floor structural fill slab; reactor cavity wall; containment sump under reactor vessel, refueling canal walls and floor; crane wall; steam generator compartments; pressurizer compartment; operating deck at elevation 733.63; and other structures as described below.

The portion of this structure which separates the upper compartment from the lower compartment is defined as the divider barrier. There are seals that extend across the gap between the inside surface of steel containment vessel and the concrete structures within the vessel. These seals form part of the divider barrier between the upper and lower compartments of the containment vessels. During normal operating conditions, the seals prevent airflow around the ice condensers. In an accident, the seals and the other divider parts limit the amount of hot gases, steam, and vapor that can bypass the ice condensers. The refueling canal walls and floor, steam generator compartments, pressurizer compartment, and operating deck at elevation 733.63 each include divider barrier components.

The steel containment vessel also contains an equipment access hatch and two personnel access doors. Details of these components are discussed below.

Concrete Interior Structures

The concrete interior structures are a complex assemblage of reinforced concrete walls, slabs, and columns housed inside the steel containment vessel. They act as a barrier routing steam to and through the ice condenser in the event of a LOCA. The interior concrete structures constitute the primary support system for the equipment in the steel containment vessel structure. The reactor, four steam generators, four reactor coolant pumps, pressurizer, ice condenser, reactor instrumentation, air-handling equipment, and various other support systems are located inside this structure. Major equipment such as steam generators, reactor coolant pumps, and pressurizers are anchored through the steel liner plate into the concrete base slab.

At two locations within the interior concrete, openings are provided in the structural walls to permit access for equipment maintenance. These openings are filled with concrete blocks.

Ice Condenser

The ice condenser is essentially a well-insulated cold storage room in which sodium tetraborate ice is maintained in an array of 12-inch diameter by 48-feet high vertical cylindrical columns, with the space between columns forming the flow channels for steam and air. The ice absorbs the thermal energy resulting from LOCA or steam line break in the steel containment vessel structure. The condensation of steam on the ice limits the pressure and temperature to values less than steel containment vessel design allowable. The baskets are arranged to promote heat transfer from the steam to ice during and following these accidents. The function of the ice baskets is also to provide adequate structural support for the ice and maintain the geometry for heat transfer during or following the worst loading combinations. The ice baskets are supported by a steel-framed structure that is comprised of a system of horizontal lattice frames supported by vertical columns arranged in a series of 24 bays. The support configuration of the ice condenser steel framed structure is such that its arrangement prevents transmission of loads from ice baskets, lattice frames and columns to the steel containment vessel.

The ice condenser compartment extends from the support floor at elevation 721 (divider barrier) to the top of the crane wall. The uppermost section of the ice condenser forms the upper plenum, which accommodates the air cooling equipment and provides access for ice loading and maintenance. An intermediate deck above the ice condenser forms the ceiling of the ice bed region and the floor of the upper plenum. The upper plenum houses the air handling units and the distribution ducts to the wall panels and provides working space for maintenance on the ice baskets. The upper plenum contains a top deck that provides support for blanket panels that form a thermal and vapor barrier. The top deck structure supports the grating as well as the bridge crane and rail assembly and the air handling units. The bridge crane is provided for construction and maintenance purposes. Wall panels are designed under normal operating conditions to thermally insulate the ice bed from the heat conducted through the crane wall, the steel containment vessel wall, and the end walls. In addition, they are designed to provide a circulation path for cold air and a heat transfer surface next to the ice bed so that the ice is maintained in its design temperature range.

In the event of a design basis accident, the lower inlet doors open due to the pressure rise in the lower compartment. This allows steam to flow from the lower compartment into the ice condenser compartment. The steam is condensed as it enters the ice condenser compartment, thus limiting the peak pressure in the containment. Upon pressure increase in the ice compartment, the intermediate and top doors in the ice condenser compartment open to allow air to flow into the upper compartment. Seals are provided on the boundary of the lower and upper compartments and on the hatches in the operating deck to limit steam bypassing the ice condenser.

Equipment Access Hatch and Personnel Airlocks

An equipment hatch constructed of carbon steel has been provided to enable passage of large equipment and components from the auxiliary building into the steel containment vessel during plant shutdown. The equipment hatch door is of the hinged, double-leaf, marine type with seals for providing an airtight closure between the annulus surrounding the steel containment vessel and the inside of the auxiliary building. The interior portion of the passageway inside the steel containment vessel is sealed with a convex circular steel plate during plant operation. Additionally, two carbon steel personnel airlocks provide personnel access from the auxiliary building into the reactor building. 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.

Penetrations

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. These assemblies function to provide containment pressure integrity during both normal and design basis accident conditions and to maintain the leakage from the containment within acceptable limits. The containment integrity safety 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 (HELB).

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 systems, structures, and components. 10 CFR 54.4(a)(1)

- Provide physical support, shelter, and protection for safety-related systems, structures, and components that prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10 CFR 100. 10 CFR 54.4(a)(1)
- Control the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. 10 CFR 54.4(a)(1)
- Provide sufficient sodium tetraborate ice and air volumes to absorb the energy released to the steel containment vessel in the event of design basis events so that the pressure is within acceptable limits. 10 CFR 54.4(a)(1)
- Provide a source of water for emergency core cooling systems. The containment sump under the reactor vessel collects water inventory from LOCA events for recirculation to the reactor. The sump screen provides a filter function to protect the associated equipment from debris. 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 functions identified for 10 CFR 54.4(a)(1). 10 CFR 54.4(a)(2)
- Provide 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)

UFSAR References

Section 3.8.1	Section 6.5
Section 3.8.2	Section 6.6.3
Section 3.8.3	Figure 1.2.3-11
Section 3.8.5	Figure 1.2.3-12
Section 6.2.1	Figure 1.2.3-13

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**[a]
Steel and Other Metals	
Cranes: rails	Support for Criterion (a)(2) equipment
Cranes: structural girders	Support for Criterion (a)(2) equipment
Penetration sleeves	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Penetration sleeves: sleeve and bellows	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Personnel airlock, equipment hatch	Fire barrier Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Personnel airlock, equipment hatch: locks, hinges, and closure mechanisms	Fire barrier Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Beams, columns and base plates	Heat sink Support for Criterion (a)(1) equipment
Containment sump liner plates	Heat sink Shelter or protection Support for Criterion (a)(1) equipment
CRDM support structure	Support for Criterion (a)(1) equipment

Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review

Component	Intended Function[a]
Ice baskets	Heat sink Support for Criterion (a)(1) equipment
Ice baskets lattice support frames	Heat sink Support for Criterion (a)(1) equipment
Intermediate deck and top deck of ice condenser	Insulation Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Kick plates and curbs	Direct flow
Lower inlet doors	Direct flow Heat sink Insulation Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Lower support structure structural steel: beams, columns, plates	Heat sink Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Personnel access doors, equipment access floor hatch and escape hatches	Direct flow Heat sink Insulation Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Pressure relief panels	Heat sink Pressure relief Shelter or protection Support for Criterion (a)(1) equipment
Steel liner plate	Heat sink Shelter or protection Support for Criterion (a)(1) equipment

**Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review**

Component	Intended Function[a]
Sump screens	Shelter or protection Support for Criterion (a)(1) equipment
Thermal barrier	Direct flow Shelter or protection Support for Criterion (a)(1) equipment
Turning vanes	Direct flow Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Wall panels	Insulation Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Steel elements (accessible areas): liner; liner anchors; integral attachments (steel containment vessel)	Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Steel elements (inaccessible areas): liner; liner anchors; integral attachments (steel containment vessel)	Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the steam generators, pressurizer, and reactor coolant pumps)	Support for Criterion (a)(1) equipment

Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review

Component	Intended Function[a]
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the reactor pressure vessel)	Support for Criterion (a)(1) equipment
Concrete	
Beams, columns, floor slabs and interior walls (reactor cavity and primary shield walls; pressurizer and reactor coolant pump compartments; steam generator compartments; refueling canal, crane wall and missile shield slabs and barriers)	Direct flow Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Canal gate bulkhead	Direct flow Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
CRD missile shield	Direct flow Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Concrete shield blocks	Heat sink Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Curbs	Direct flow

**Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review**

Component	Intended Function[a]
Ice condenser support floor (including wear slab)	Direct flow Heat sink Insulation Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): Shield building wall and dome: interior	Fire barrier Flood barrier Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): Shield building wall and dome: above grade exterior	Flood barrier Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): Shield building; exterior above and below grade; foundation	Flood barrier Missile barrier Pressure boundary Shelter or protection 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[a]
Concrete (accessible areas): Shield building; below grade exterior; foundation	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): Shield building below grade exterior; foundation	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): Shield building; foundation	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): Shield building; ring tension beam: interior	Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (accessible areas): Shield building; ring tension beam: above grade exterior	Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Sumps	Shelter or protection Support for Criterion (a)(1) equipment

**Table 2.4-1 (Continued)
Reactor Building
Components Subject to Aging Management Review**

Component	Intended Function[a]
Elastomers and Other Materials	
Lower inlet doors	Direct flow Heat sink Insulation Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Moisture barrier	Direct flow Shelter or protection Support for Criterion (a)(1) equipment
Seal between the upper and lower compartments (divider barrier)	Support for Criterion (a)(1) equipment
Service level I coatings	Support for Criterion (a)(2) equipment

a. Intended functions are defined in Table 2.0-1.

2.4.2 Water Control Structures

Description

The following water control structures are reviewed in this section:

- Condenser Cooling Water (CCW) Pumping Station and Retaining Walls
- CCW Pumping Station Intake Channel
- ERCW Discharge Box
- ERCW Protective Dike
- ERCW Pumping Station and Access Cells
- Skimmer Wall, Skimmer Wall Dike A and Underwater Dam

CCW Pumping Station and Retaining Walls

The purpose of the CCW pumping station (also known as intake pumping station) is to house the condenser circulating water pumps, cooling tower makeup pumps, the fire/flood mode pumps, and safety-related ERCW system components. The purpose of the retaining walls or wing walls of the intake structure is to protect the forebay of the intake channel against earth slides during a design basis event.

The CCW pumping station and retaining walls are Category I structures. The CCW pumping station is a multi-story reinforced concrete box-type structure founded on bedrock and back-filled on three sides to approximately the elevation of the top deck of the structure. The retaining walls are rock founded, reinforced concrete cantilever walls located at each end of the CCW pumping station on the forebay side of the CCW pumping station. These walls retain the earth fill adjacent to the CCW pumping station that transitions into the intake channel. Additionally, the retaining walls or wing walls of the intake structure are designed to protect the forebay of the intake channel against earth slides during an earthquake.

For each unit, three CCW pumps are provided in the intake pumping station to pump condenser circulating water through the condensers. Each pump is installed in a separate suction well with entering water from the intake channel strained by trash racks and a traveling screen. The fire/flood mode pumps are submersible pumps located in the CCW pumping station. These fire/flood mode pumps of the HPFP system provide a safety-related water supply for the emergency feedwater to the steam generators in the event of a flood above grade. Additionally, these same pumps provide a source of make-up water for the spent fuel pits if spent fuel pit water is lost during a design basis event. An electrical cable tunnel exists on the north-west corner of the pumping station that provides access to electrical raceways for this structure that are routed into a duct bank in the yard area.

The CCW pumping station and retaining walls have 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 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). 10 CFR 54.4(a)(3)

CCW Pumping Station Intake Channel

The purpose of the CCW pumping station intake channel is to provide a source of water required for the Commission's regulated event fire protection (10 CFR 50.48) and provide a source of make-up water for the spent fuel pits if spent fuel pit water is lost during a design basis event.

The CCW pumping station intake channel is located on the north side of the main plant area. The CCW pumping station intake channel is an excavated channel that consists of an approach channel and the forebay for water retention that extends from the CCW pumping station and provides a conveyance path of raw water from the ultimate heat sink, the Tennessee River (also known as the Chickamauga Reservoir). Parts of the side slope for the approach channel and the entire forebay area were constructed with sloped embankments. The slopes are protected from wind-wave activity with riprap. Sloped rock walls form the side slopes of the excavated approach channel projecting in front of the CCW pumping station. The rock walls of the approach channel are covered with a 12-inch-minimum thickness of concrete to prevent possible erosion of material from joints in the rock due to wave action of water in the intake channel. The intake channel provides cooling water for the condensers, raw cooling water system and the fire/flood mode pumps of the HPFP system.

The CCW pumping station approach channel slopes are not designed as Category I slopes. The side slopes in the forebay area are Category I slopes and are constructed to remain stable for the most critical design conditions. The intake channel is relied upon to provide a source of water supply for equipment credited in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48) equipment which is housed in the CCW pumping station.

The CCW pumping station intake channel has no intended functions for 10 CFR 54.4(a)(1).

The CCW pumping station intake channel has the following intended functions for 10 CFR 54.4(a)(2) and (a)(3).

- 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 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). 10 CFR 54.4(a)(3)

ERCW Discharge Box

The purpose of the ERCW discharge box is to provide a path for discharge water of both trains of the ERCW, which flows into an open basin in the structure and then flows by gravity to the cooling towers return channel.

The ERCW discharge box is a Category I structure located south east of the Unit 2 reactor building. The ERCW discharge box is a soil-supported, rectangular, reinforced concrete box structure. The ERCW discharge box is part of the ERCW system. A reinforced concrete roof protects the discharge from being blocked by tornado missiles.

The ERCW discharge box 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 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)

ERCW Protective Dike

The purpose of the ERCW protective dike, coupled with the mechanics of river flow, is to provide protection of the ERCW structure against design basis events associated with the Tennessee River.

The ERCW protective dike, a Category I structure, is a soil-supported, rock embankment structure. The ERCW protective dike structure is located just upstream from the ERCW pumping station, jutting out into the Tennessee River (also known as the Chickamauga Reservoir). This dike provides protection for the ERCW pumping station from an impact from a runaway barge. The dike is seismically qualified to prevent blockage of the intake to the ERCW pumping station. The dike has Category I slopes and is designed to remain stable for the most critical design conditions.

A floating barrier, comprised of steel cables and anchored to rigid supports, is provided in front of the ERCW pumping station. The steel cable is supported along the surface of the river by a series of pontoons fastened to the steel cable. This floating barrier is not safety-related, does not perform an intended function for license renewal, and is not in the scope of license renewal.

The ERCW protective dike has the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- 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)

The ERCW protective dike has no intended functions for 10 CFR 54.4(a)(3).

ERCW Pumping Station and Access Cells

The purpose of the ERCW pumping station and access cells is to maintain the source of the plant's ultimate heat sink.

The ERCW pumping station and access cells are Category I structures. The ERCW pumping station is a waterfront multi-story, reinforced concrete, rectangular box-type structure located in the Tennessee River (also known as the Chickamauga Reservoir), north of the reactors and off the west bank of the site. The ERCW pumping station meets all of the ultimate heat sink requirements for the plant. The base for the foundation of the ERCW structure is non-reinforced tremie concrete poured atop the bedrock and contained by steel sheet pile cells. The steel sheet piling is used to provide a form for the concrete base and is not required as a supporting element in the completed structure. Atop the base is the ERCW pumping station, which houses the pumps and the electrical and mechanical equipment for the ERCW system.

Six access cells, designated as cells a, b, c, d, e and f, connect the ERCW pumping station with the site land mass. The cells, founded on bedrock, are filled with tremie concrete contained by steel sheet piling. The embankments on each side of the cells are covered with rock. The connected cells serve as an access pathway to the ERCW pumping station and the ERCW piping and conduit banks for Class IE circuits are routed and supported within the connected cells. The top deck of the cells is reinforced concrete slab providing missile protection for the ERCW piping and conduit banks.

The top deck or slab at El. 720.0 of the ERCW pumping station supports eight ERCW pumps, four traveling screens, and a pedestal crane for handling of equipment. This deck is completely surrounded by a concrete wall, 16 feet high, with a structural steel grillage roof system for missile protection of the pumps, traveling screens and other safety-related equipment. The second deck or slab at El. 704 is occupied by the electrical equipment consisting of 6.9-kV transformers, 480-V motor control centers, and cable trays. The third deck or slab at El. 688.0 supports the mechanical strainers and piping. The concrete base contains embedded steel-lined waterway conduits and shafts for the pumps, stoplogs, traveling screens and trash racks. The base also contains the discharge headers and electrical conduits. Stoplogs are provided for the purpose of dewatering the individual compartments for inspection and maintenance.

The ERCW pumping station is protected against fire by virtue of its design. All pumps and essential cables and instruments are protected from fire by being enclosed within concrete walls. Additional protection against tornado-generated missiles is provided by thick reinforced concrete walls around the exterior of the station and interior reinforced concrete walls separating train A and B pumps within the exterior walls. Protection of the ERCW pumps is also provided by a structural steel grillwork roofing system composed of wide-flange beams, supported by the interior shield walls, spanning across the top of the El. 736.0 concrete walls and over the ERCW pumps.

Each pump is installed in a separate steel-lined suction well with entering water from the intake channel strained by trash racks and a traveling screen. Each traveling screen is located in a rectangular well with the screen drive mounted at the top of the screen on the deck above the well. Guides mounted in or on the walls of the well support the screen in the lateral direction with additional support provided for the vertical direction. Headframes and frames for the screens are of welded steel construction with bolted connections.

The ERCW pumping station and access cells have 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 a source of cooling water for safe shutdown of plant. The ERCW pumping station structure and ERCW system are designed to provide a reliable source of cooling water from the Tennessee River. The Tennessee River is the ultimate heat sink as described in the UFSAR. 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 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). 10 CFR 54.4(a)(3)

Skimmer Wall, Skimmer Wall Dike A and Underwater Dam

Cell 12 of the skimmer wall structure is the only portion of the skimmer wall, skimmer wall dike A and underwater dam structures that is within the scope of license renewal for 10 CFR 54.4(a)(2). The purpose of skimmer wall cell 12 is to maintain its structural integrity during normal plant operation and during and following postulated design basis accidents in support of the ERCW safety function.

The water from the Tennessee River flows into the forebay of the intake channel under a skimmer wall. The skimmer wall is constructed across the entry to the intake channel to allow only the cooler water from the bottom of the Tennessee River to enter the intake channel to improve the efficiency of the main condensers. The skimmer wall is comprised of a series of circular cells with the skimmer wall supported between the circular cells. The circular cells are constructed of steel sheet piles driven to bedrock with concrete placed in the bottom, filled with crushed rock and capped by concrete at top. The skimmer wall between the cells is formed by stacking precast reinforced concrete beams supported by structural steel beams and steel columns built into the circular cell sheet pile wall. The ERCW pumping station, located offshore in the Tennessee River, is adjacent to the north end of the skimmer wall. Because of its proximity to the ERCW pumping station, the circular cell closest to the pumping station, cell 12, was seismically evaluated and qualified to maintain structural integrity during a design basis event.

The skimmer wall dike A is a rock embankment that projects out into the Tennessee River and forms the south enclosure boundary of the intake channel forebay, connecting to the first circular cell at the south end of the skimmer wall configuration.

The underwater dam, located in the Tennessee River, consists of sound quarry-run rock not subject to deterioration by flowing water.

The skimmer wall and circular cells other than cell 12 have no intended functions for 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

The skimmer wall dike A and underwater dam have no intended functions for 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

Cell 12 of the skimmer wall structure has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

Cell 12 of the skimmer wall structure has the following intended function for 10 CFR 54.4(a)(2).

- 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).

UFSAR References

CCW Pumping Station and Retaining Walls

Section 1.2.2.8	Figure 1.2.3-18
Section 2.4A.2.2	Figure 1.2.3-19
Section 2.4A.4.1	
Section 2.4.11.5.1	
Section 10.4.5.2	

CCW Pumping Station Intake Channel

Section 2.4.8.1	Figure 2.1.2-1
Section 2.5.6.1.2	Figure 2.4.8-1
Section 2.5.6.2.2	Figure 2.5.6-2

ERCW Discharge Box

Section 3.8.4.1.8	Figure 3.8.4-10

ERCW Protective Dike

Section 2.2.3.2	Figure 2.1.2-1
Section 2.5.6.2.3	Figure 3.7.1-2
	Figure 3.8.4-9

ERCW Pumping Station and Access Cells

Section 3.8.4	Figure 1.2.3-14
Section 3.8.4.1.7	Figure 1.2.3-15
	Figure 1.2.3-16
	Figure 3.8.4-7
	Figure 3.8.4-8
	Figure 3.8.4-9

Skimmer Wall, Skimmer Wall Dike A and Underwater Dam

None

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 water control 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 2.4-2 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
Water Control Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Steel and Other Metals	
Pedestal crane	Support for Criterion (a)(2) equipment
Steel liner plate	Heat sink Shelter or protection Support for Criterion (a)(1) equipment
Steel sheet piles for cells a through f and 12	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Structural steel: beams, columns, plates	Fire barrier Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Trash racks	Heat sink Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Trash racks associated structural support framing	Support for Criterion (a)(1) equipment
Traveling screen casing and associated structural support framing	Support for Criterion (a)(2) equipment
Concrete	
Concrete (accessible areas): all	Fire barrier Flood barrier Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

**Table 2.4-2 (Continued)
Water Control Structures
Components Subject to Aging Management Review**

Component	Intended Function[a]
Concrete (accessible areas): exterior above- and below-grade; foundation	Flood barrier Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas): all	Flood barrier Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Beams, columns, floor slabs and interior walls	Fire barrier Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Cable tunnel	Missile barrier Support for Criterion (a)(3) equipment
Concrete cover for the rock walls of approach channel	Shelter or protection Support for Criterion (a)(2) equipment
Discharge box and foundation	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment
Exterior concrete slabs and concrete caps	Missile barrier Support for Criterion (a)(3) equipment
Sumps	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-2 (Continued)
Water Control Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Masonry walls	Fire barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Other Materials	
Earthen embankment	Shelter or protection Support for Criterion (a)(1) equipment
Riprap	Shelter or protection Support for Criterion (a)(2) equipment
Rock embankment	Shelter or protection Support for Criterion (a)(1) equipment

a. Intended functions are defined in Table 2.0-1.

2.4.3 Turbine Building, Aux/Control Building and Other Structures

Description

The following structures are included in this review.

- Turbine Building
- Auxiliary Control Building
  - Auxiliary Building
  - Control Bay (or Control Building)
  - Additional Equipment Buildings, Unit 1 and Unit 2
  - Condensate Demineralizer Waste Evaporator Building
  - Waste Packaging Area
- Additional Diesel Generator Building
- Carbon Dioxide Storage Building
- Condensate Storage Tanks' Foundations and Pipe Trench
- Diesel Generator Building
- East Steam Valve Room, Unit 1
- East Steam Valve Room, Unit 2
- High Pressure Fire Protection Pump House and Water Storage Tanks' Foundations
- Manhole, Handhole and Duct Banks
- Radiation Monitoring Station, Unit 1
- Radiation Monitoring Station, Unit 2
- Refueling Water Storage Tank Foundation and Pipe Tunnel, Unit 1
- Refueling Water Storage Tank Foundation and Pipe Tunnel, Unit 2
- Transformer and Switchyard Support Structures and Foundations

Turbine Building

The purpose of the turbine building is to provide housing for the steam and power conversion systems components. The turbine building contains safety-related components.

The turbine building is a non-Category I structure located adjacent and west of the control bay, a Category I structure. The turbine building is a multistory reinforced concrete and steel framed structure that has a steel superstructure with a metal siding enclosure above the turbine operating deck at elevation 732.0. The turbine building's reinforced concrete base foundation is founded on bedrock. Below the operating deck, the structure consists of structural steel framing and reinforced concrete floors, walls and foundations.

The foundation for the turbine-generator is within the turbine building but structurally isolated from the turbine building. The turbine building houses equipment associated with the main turbine generator. The building and its foundation have been evaluated for tornado effects. The metal siding panels will fail at loads considerably below the design tornado loading and will become missiles that could impact the control building. The siding will fail before the main girts (lateral supports) are overloaded enough to cause failure. The walls and roof of the control building are designed to resist the forces resulting from missiles from the turbine building.

The turbine building will not collapse against the control building in a design basis event such that its failure would result in failure of the control building. During a design basis event, radiation shielding at the entrances from the turbine building to the control building attenuate radiation from the radioactive cloud which is assumed to occupy the turbine building during the event.

The turbine building has no intended function for 10 CFR 54.4(a)(1).

The turbine building has the following intended functions for 10 CFR 54.4 (a)(2) and (a)(3).

- Provide physical support, shelter, and protection for safety-related and 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 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)

Auxiliary Control Building

The auxiliary control building is a Category I structure consisting of five major divisions: the auxiliary building portion, the control bay portion, the waste packaging area, the condensate demineralizer waste evaporator building portion, and the additional equipment building portion (Unit 1 and Unit 2). This building is a multistory reinforced concrete structure which provides housing for the engineered safety feature systems as well as other systems necessary to the two reactor units. The five major divisions of the auxiliary control building are described as individual structures below and are reviewed as five separate structures.

Auxiliary Building

The purpose of the auxiliary building is to provide housing to portions of engineered safety features systems, auxiliary systems, steam and power conversion systems, and control systems such that their safety functions are not impacted. The auxiliary building also supports and protects nonsafety-related equipment including chemistry lab equipment. The auxiliary building is maintained under a slight negative pressure to control the release of particulate and gaseous contamination from the building.

The auxiliary building is a Category I structure with the eastern portion of the building located between the Unit 1 and Unit 2 reactor buildings and the west end built integrally with the control bay. The auxiliary building is a multistory reinforced concrete structure founded on bedrock. A 2-foot-minimum-thick concrete subpour underlies the structural concrete and caps the top of the irregular rock surface. The base slab over the 2-foot-minimum-thick subpour is anchored with rebar grouted to various depths into rock to resist hydrostatic uplift pressures under flood conditions.

The building is comprised of structural steel and reinforced concrete walls, slabs, foundation mat, and roof. The auxiliary building is separated from the reactor buildings and the additional equipment buildings by an expansion joint which is filled with material that prevents interaction of the buildings when subjected to seismic motion. The roof is a reinforced concrete slab constructed on metal roof decking supported by steel purlins and steel roof trusses and protected with a polyurethane elastomer weather coating. Structural steel framing supports the auxiliary building roof over the area serviced by the main building crane. The auxiliary building is designed to maintain its structural integrity during and following postulated design basis accidents and extreme environmental conditions.

The building is provided with a railroad access door and door track constructed of welded steel. Pressure-confining personnel access control doors maintain the required control room boundary.

The spent fuel pool, fuel cask set down area and loading pit, and fuel transfer canal are housed within the auxiliary building. SQN uses a single or common spent fuel pit, also known as the spent fuel pool, and a fuel transfer canal that services Unit 1 and Unit 2. The spent fuel pool and the fuel cask set down area and loading pit are reinforced concrete elements integral to the auxiliary building walls and the base floor slabs are supported on bedrock. The spent fuel pool, fuel cask set down area and loading pit, and fuel transfer canal are lined with stainless steel plates to ensure water tightness. The design of the spent fuel pool, fuel cask set down area and loading pit, and fuel transfer canal liners includes a leak chase system behind the welded seams that connects the ¼-inch liner plates. The fuel transfer canal gate, when installed, forms a boundary between the fuel transfer canal and the spent fuel pit. When the fuel transfer canal is draining, inflatable elastomer seals provide a watertight seal between the gate and the pool wall liner face. The gate seal is replaced after a specified time period. A cask loading area gate is abandoned in the open storage position. Both corrosion resistant steel gates are of similar construction and are Category I. The moving of fuel from the fuel transfer canal into the reactor building uses a transfer tube that runs from the fuel transfer canal into the primary containment. The transfer tube consists of a 20-inch stainless steel pipe installed inside a 24-inch carbon steel pipe. The inner pipe acts as the transfer tube and is fitted with a double gasketed blind flange in the refueling canal. The inner pipe is welded to the containment penetration sleeve. Expansion bellows are provided on the pipes to compensate for differential movement between the two pipes and between the outer pipe and other structures.

The west steam valve rooms are compartments of the auxiliary building housing the isolation valves for the main steam lines penetrating the west side of each reactor building. From these rooms the main steam lines exit the auxiliary building. The roof and hatches in this area are designed to blow away and provide and maintain the necessary flow areas during a design basis event.

Six hinged covers combine to close a railroad access hatch opening in the 734.0 floor elevation of the auxiliary building. The hatch covers and their embedded frame provide a semi-airtight closure and operate in conjunction with the railroad access door to provide an airlock. The railroad access door at elevation 706.0 provides closure for the access opening in the north wall at the railroad tracks.

The structure includes cranes, monorails and jib cranes such as the 125/10-ton auxiliary building crane, which is a single trolley, overhead, electric travelling type crane. Other in-scope cranes, monorails and jib cranes located in the auxiliary building include the cranes and hoists that meet the criteria of 10 CFR 54.4 (a)(1) and (a)(2) as well as guidelines provided in NUREG-0612, C*ontrol of Heavy Loads at Nuclear Power Plants*. These include the 4-ton monorail hoist and trolley (El. 690.0) and 5-ton monorail hoist and trolley (El. 653.0), spent fuel pit bridge crane, and nonsafety-related jib cranes and monorails located in the auxiliary building. These cranes will be used to handle loaded and unloaded fuel casks, shield plugs, hatch covers, spent fuel assemblies, new fuel assemblies, and general maintenance work as required.

The auxiliary building performs a secondary containment intended function providing a positive barrier to all potential primary containment leakage pathways during a LOCA and to radioactive contaminants released in accidental spills and fuel handling accidents that may occur in the auxiliary building. Certain parts of the building's interior and exterior walls, floor slabs, and a part of its roof form the isolation barrier. Openings in the isolation barrier consist of sealed mechanical and electrical penetrations or airlocks. The building by design and construction is leak tight.

The 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).
- Control the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits. 10 CFR 54.4(a)(1)
- Provide protection for safe storage of new and spent fuel. 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 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), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

Control Bay

The purpose of the control bay (or control building) is to house the main control room, auxiliary instrument room, computer room, battery and dc equipment rooms, switchyard relay room, plant communications room and service facilities (office space, kitchen, toilet facilities, and mechanical equipment room for heating, ventilation, and air-conditioning equipment). The control room in conjunction with control room HVAC system provides a habitable environment for plant operators so that the plant can be safely operated and shutdown under design basis accident conditions to meet general design criterion 19 of 10 CFR 50, Appendix A and 10 CFR 100 requirements.

The control bay is a multistory Category I structure built integrally with the auxiliary building. The structure is separated from the turbine building by an expansion joint filled with fiberglass insulation which prevents interaction of the two buildings when subjected to seismic motion. The building is a reinforced concrete and structural steel structure founded on bedrock.

Structural steel framing in the control bay consists of steel framed bays in portions of elevation 706.0 and the entire floor at elevation 732.0. At elevation 706.0 the two exterior bays on both ends of the building are pipe run areas with steel grating on steel beams and steel columns. The floor of the interior bays (between column lines C3 and C11) at elevation 732.0 is a reinforced concrete slab cast on metal decking. The floor of the two exterior bays (between column lines C1 and C3 and C11 and C13) at elevation 732.0 is a reinforced concrete slab acting compositely with steel beams encased in concrete. The roof is a reinforced concrete slab protected with a polyurethane elastomer weather coating.

The control bay 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 radiation shielding protection and habitable environment for plant operators and equipment/components. 10 CFR 54.4(a)(1)
- Provide centralized area for control and monitoring of nuclear safety-related equipment. 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 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), anticipated transients without scram (10 CFR 50.62), and station blackout (10 CFR 50.63). 10 CFR 54.4(a)(3)

Additional Equipment Buildings, Unit 1 and Unit 2

The purpose of the additional equipment buildings (also known as the auxiliary building additions) is to provide accommodations for additional accumulators housed within the building. The Unit 2 additional equipment building also houses ice condenser support equipment.

The Category I additional equipment buildings are multistory reinforced concrete structures. The Unit 1 additional equipment building is adjacent to the Unit 1 reactor building and the northeast end of the auxiliary building, and the Unit 2 additional equipment building is adjacent to the Unit 2 reactor building and the southeast end of the auxiliary building. Both buildings are reinforced concrete structures founded on bedrock and separated from their respective reactor buildings and the auxiliary building by an expansion joint filled with fiberglass insulation, which prevents interaction of the buildings when subjected to seismic motion. The buildings are comprised of reinforced concrete exterior walls, slabs, and interior columns. The foundations are a reinforced concrete wall grid system which starts beneath the base slab at grade and extends down to reinforced concrete foundation slabs placed on bedrock. The roofs are reinforced concrete slabs protected with a polyurethane elastomer weather coating.

The Unit 2 additional equipment building is part of the auxiliary building secondary containment enclosure (ABSCE) boundary, which provides the function of an isolation barrier during certain postulated accidents involving airborne radioactive contamination to limit off-site exposure.

The additional equipment buildings have 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)
- Control the potential release of fission products to the external environment so that offsite consequences of design basis events are within acceptable limits (Unit 2 additional equipment building only). 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 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). 10 CFR 54.4(a)(3)

Condensate Demineralizer Waste Evaporator Building

The purpose of the condensate demineralizer waste evaporator building is to house equipment necessary for processing condensate demineralizer wastes and for serving as a backup in processing floor drain wastes.

The condensate demineralizer waste evaporator building (CDWEB) is a Category I multi-story reinforced concrete structure south of the waste packaging area building abutting the east wall of the Unit 2 additional equipment building. The structure is separated from the waste packaging area and the Unit 2 additional equipment building by an expansion joint filled with fiberglass material which prevents interaction of the buildings if subjected to seismic motion. The condensate demineralizer waste evaporator building structure is comprised of reinforced concrete and structural steel and is supported on steel H-bearing piles driven into backfill material to refusal to sound rock. The intermediate floor and roof are supported by interior bearing walls and metal decking spanning steel beams.

The CDWEB has the following intended function for 10 CFR 54.4(a)(1) and (a)(2).

- 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)

The condensate demineralizer waste evaporator building has no intended functions for 10 CFR 54.4(a)(3).

Waste Packaging Area

The purpose of the waste packaging area structure (also known as waste packaging building) is to provide an area for receiving, sorting, and compacting dry active waste.

The waste packaging area, located on the east end of the auxiliary building, is a one-story reinforced concrete structure supported on steel H bearing piles driven into backfill material to refusal in sound rock and located on the east end of the auxiliary building. The roof of the structure consists of a series of precast beams tied together by a mat of reinforcing steel welded to plates embedded in the beams and topped by four inches of poured-in-place concrete. The roof is protected with a polyurethane elastomer weather coating. The structure is separated from the auxiliary building and the condensate demineralizer waste evaporator building by an expansion joint filled with fiberglass insulation which prevents interaction of the buildings when subjected to seismic motion.

The waste packaging area has no intended functions for 10 CFR 54.4(a)(1) or 10 CFR 54.4(a)(3).

The waste packaging area has the following intended function for 10 CFR 54.4(a)(2).

- 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)

Additional Diesel Generator Building

The purpose of the additional diesel generator building (ADGB) was to house the fifth diesel generator, which SQN has since abandoned. However, the ADGB contains unisolable sections of safety-related essential raw cooling water (ERCW) piping. Blind flanges are installed where the piping immediately emerges through the base slab floor and a missile protection structure is installed over the blind flanges. The Category I qualification only applies to portions of the building structure required to support and protect this piping, which consists of the base slab floor and the missile protection structure.

The ADGB is a Category I structure that is a multistory reinforced concrete structure consisting of reinforced concrete walls, floors, and roof supported on a concrete base mat founded on structural fill.

The ADGB has the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- 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)

The additional diesel generator building has no intended functions for 10 CFR 54.4(a)(3).

Carbon Dioxide Storage Building

The purpose of the carbon dioxide storage building is to house carbon dioxide for the fire protection/suppression system within the building required for the Commission's regulated event fire protection (10 CFR 50.48).

The carbon dioxide storage building, located south of the control building, is a reinforced concrete rectangular box structure comprised of a concrete base slab on structural backfill, concrete walls and a concrete roof slab at grade. The structure is below grade with the exception of the top of the roof slab. The structure contains no safety-related systems or components.

This structure has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The carbon dioxide storage building has the following intended function for 10 CFR 54.4(a)(3).

- Provide 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).

Condensate Storage Tanks' Foundations and Pipe Trench

The purpose of the condensate storage tanks' foundations and pipe trench is to provide structural support to the condensate storage tanks and housing for the associated piping, required for the Commission's regulated event station blackout (10 CFR 50.63).

The condensate storage facility is comprised of two large storage tanks, each supported on a reinforced concrete ring foundation that is cast on structural backfill, with the associated piping for the system routed in reinforced concrete trenches from the condensate storage tanks into the Unit 2 turbine building. Each carbon steel storage tank has a minimum as-designed capacity of 385,000 gallons. The tanks are located in the yard adjacent to the south wall of the Unit 2 turbine building.

Support for each condensate storage tank consists of a circular reinforced concrete ring foundation supporting the outer shell base with the bottom of the tank founded on compacted structural fill and oil treated sand. The pipe trench consists of reinforced concrete founded on compacted structural fill with a concrete slab roofing cover.

The condensate storage tanks are connected to the condenser hotwell and hotwell pumps to maintain water inventory in the secondary system. Auxiliary feedwater (AFW) suction piping originates inside each tank and then continues into the turbine building in a pipe trench covered with removable concrete slabs. The condensate storage tanks provide the primary (but not essential) source of water for the auxiliary feedwater pumps following a station blackout. The tanks are nonsafety-related tanks.

The condensate storage tanks' foundations and pipe trench have no intended functions for 10 CFR 54.4(a)(1).

The condensate storage tanks' foundations and pipe trench have the following intended functions for 10 CFR 54.4(a)(2) and (a)(3).

- 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 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)

Diesel Generator Building

The purpose of the diesel generator building is to provide housing for the emergency diesel generators and associated equipment located in each of four compartments. The building contains the four diesel generators, fuel oil day tanks, starting air receivers-compressors, air intake vents and filters, mufflers, controls, and their auxiliary equipment. Each diesel generator with its associated equipment is housed in an individual room within the diesel generator building. The diesel generators provide standby AC power for engineered safety features (ESF) systems. The building interior and exterior walls that separate the diesel generators and associated equipment are fire barriers. Diesel fuel storage tanks are embedded in the base slab. The fuel oil vent piping protruding from the east wall of the diesel generator building at elevation

734.5 feet and through the roof of the building near the east wall is provided with protection against tornado generated missiles.

The Category I diesel generator building is a two-story rectangular reinforced concrete box-type structure founded on a structural backfill. The diesel generator building is comprised of reinforced concrete foundation slab with diesel fuel storage tanks embedded within, exterior and interior walls, floor slabs and a roof slab, masonry walls and miscellaneous structural steel. Reinforced concrete interior walls provide for the compartmentalization of the four diesel generators housed within the structure.

The diesel generator building has four doors along with removable steel bulkheads above the doors that provide access to the diesel generator units. The doors and bulkheads, in conjunction with the precast concrete barrier in front of them, protect the generators from damage by tornadoes, missiles, wind, snow, ice, and rain and form a part of the security system to prevent entry into the diesel generator building by unauthorized persons. The precast concrete bulkheads consist of several individual sections stacked into place and bolted in position to the concrete walls.

The diesel generator 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 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). 10 CFR 54.4(a)(3)

East Steam Valve Room, Unit 1

The purpose of the Unit 1 east steam valve room is to provide protection for the isolation valves of the main steam and feedwater lines from the effects of tornadoes and earthquakes, as well as provide support for the valves and main steam pipes and feedwater pipes that exit from the reactor building. Additionally, to maintain the environmental qualification of components in the valve room, the roof is designed to blow away and provide the necessary flow areas after pipe breaks.

The Category I Unit 1 east steam valve room is a reinforced concrete structure located on the east end of the Unit 1 reactor building at azimuth 180°. The structure consists principally of three reinforced concrete walls anchored into a 7-foot-thick base slab with the exterior of the reactor building serving as the west wall of the structure. The structure is supported by concrete caissons anchored in bedrock. An expansion joint separates the east steam valve room from the other adjacent structures.

Structural steel framing supports the steel roof of the east steam valve room. To protect the east steam valve room from over-pressurization due to postulated large high energy pipe breaks, the steel roof of the east steam valve room at elevation 759 is designed to relieve pressure at a maximum of 0.5 psi (72 psf) differential pressure. The roof is comprised of corrugated steel decking supported on structural steel shapes. The corrugated steel decking is fastened to the steel framing with aluminum "explosion" bolts. These bolts are sized to ensure the roof will blow off at a pre-determined pressure within the east steam valve room.

The Unit 1 east steam valve room 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 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)

East Steam Valve Room, Unit 2

The purpose of the Unit 2 east steam valve room is to provide protection for the isolation valves of the main steam and feedwater lines from the effects of tornadoes and earthquakes, as well as provide support for the valves and main steam pipes and feedwater pipes that exit from the reactor building. Additionally, to maintain the environmental qualification of components in the valve room, the roof is designed to blow away and provide the necessary flow areas after pipe breaks.

The Category I Unit 2 east steam valve room is a reinforced concrete structure located on the east end of the Unit 2 reactor building at azimuth 180°. The structure consists principally of three reinforced concrete walls anchored into a 7-foot-thick base slab with the exterior of the reactor building serving as the west wall of the structure. The structure is supported by concrete caissons anchored in bedrock. An expansion joint separates the east steam valve room from other adjacent structures.

Structural steel framing supports the steel roof of the east steam valve room. To protect the east steam valve room from over-pressurization due to postulated large high energy pipe breaks, the steel roof of the east steam valve room at elevation 759 is designed to relieve pressure at a maximum of 0.5 psi (72 psf) differential pressure. The roof is comprised of corrugated steel decking supported on structural steel shapes. The corrugated steel decking is fastened to the steel framing with aluminum "explosion" bolts. These bolts are sized to ensure the roof will blow off at a pre-determined pressure within the east steam valve room.

The Unit 2 east steam valve room 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 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)

High Pressure Fire Protection Pump House and Water Storage Tanks' Foundations

The purpose of the HPFP pump house is to house the two 2500-gpm high pressure fire pumps (one electric, one diesel), associated piping and piping components, controls and instrumentation, and electrical panels and enclosures. The fire water pumps are housed in individual rooms and supply water from two water storage tanks adjacent to the fire pump house.

The purpose of the HPFP pump house water storage tanks foundations is to provide structural support of the water storage tanks.

The HPFP pump house is a single story above grade commercial grade structure located south of the Unit 2 reactor building in the yard. It is separated from safety-related systems, structures, and components such that its failure would not impact a safety function. The exterior walls are constructed of metal insulated panels. The interior of the building is partitioned with a concrete masonry block wall that performs a fire barrier intended function and provides a separate area for the different pumps housed by the structure. The pumphouse is supported on a reinforced concrete foundation slab on engineered compacted backfill. The roof is constructed of metal decking on structural steel framing, supported on pilasters integral with the exterior walls. The roof is protected with a roofing membrane.

The HPFP water storage tanks are metal storage tanks with a nominal capacity of 300,000 gallons each. Support for the fire water storage tanks consists of a circular reinforced concrete ring foundation supporting the outer shell base with the bottom of the tank founded on compacted structural fill and oil treated sand.

The HPFP pump house has no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The HPFP pump house has the following intended function for 10 CFR 54.4(a)(3).

- Provide 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). 10 CFR 54.4(a)(3)

Manhole, Handhole and Duct Banks

The purpose of manholes, handholes and duct banks is to allow underground routing of cables and piping. The redundant trains of Class 1E electrical cable are routed through Category I manholes and handholes which are either entirely separate or designed with separating, reinforced concrete walls between the trains. The following are Category I manholes and handholes located in the yard areas and are within the scope of license renewal:

- Manholes (MH) 7B, 8B, 9A, 10A, 12, 13A, 13B, 14A, 14B and 33
- Manholes groups 31 and 32
- Handholes (HH) 3 and 29
- Handhole groups 52, 53, 54, 55 and 56.

Manholes and handholes consist of reinforced concrete rectangular box structures buried underground with a reinforced concrete panel on top. The manholes have an opening and a cover to allow access. There are safety-related and nonsafety-related manholes located in the yard area. The safety-related manholes are provided with a steel plate over the standard manhole cover or an 18-inch thick concrete cover for missile protection. Safety-related handhole 29 has a 12-inch thick concrete cover for missile protection.

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. Safety-related duct banks that are buried shallow in the yard are provided with a reinforced concrete protection slab that is cast over the duct bank for missile protection.

Manholes, handholes and duct banks have 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 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)

Radiation Monitoring Station, Unit 1

The purpose of the Unit 1 radiation monitoring station (also known as the particulate iodine and noble gas monitoring station) is to house radiation monitoring equipment for main steam lines and other safety-related systems. The Unit 1 radiation monitoring station is located adjacent to the Unit 1 reactor building between the Unit 1 east steam valve room and the Unit 1 additional equipment building. The structure consists of reinforced concrete walls, floor and roof slabs and is supported on a reinforced concrete foundation slab founded on caissons. The roof is a reinforced concrete slab and is protected with a polyurethane elastomer weather coating. The structure is separated from the Unit 1 reactor building, the Unit 1 east steam valve room and the Unit 1 additional equipment building with an expansion joint filled with fiberglass insulation which prevents interaction of the buildings when subjected to seismic motion.

The Unit 1 radiation monitoring station has the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- Provide physical support, shelter, and protection for safety-related systems, structures, and components that prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10 CFR 100. 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)

The Unit 1 radiation monitoring station has no intended function for 10 CFR 54.4(a)(3).

Radiation Monitoring Station, Unit 2

The purpose of the Unit 2 radiation monitoring station (also known as the particulate iodine and noble gas monitoring station) is to house radiation monitoring equipment for main steam lines and other safety-related systems. The Unit 2 radiation monitoring station is located adjacent to the Unit 2 reactor building between the Unit 2 east steam valve room and the Unit 2 additional equipment building. The structure consists of reinforced concrete walls, floor and roof slabs and is supported on a reinforced concrete foundation slab founded on caissons. The roof is a reinforced concrete slab and is protected with a polyurethane elastomer weather coating. The structure is separated from the Unit 2 reactor building, the Unit 2 east steam valve room and the Unit 2 additional equipment building with an expansion joint filled with fiberglass insulation which prevents interaction of the buildings when subjected to seismic motion.

The Unit 2 radiation monitoring station has the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- Provide physical support, shelter, and protection for safety-related systems, structures, and components that prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10 CFR 100. 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)

The Unit 2 radiation monitoring station has no intended function for 10 CFR 54.4(a)(3).

Refueling Water Storage Tank Foundation and Pipe Tunnel, Unit 1

The purpose of the Unit 1 refueling water storage tank (RWST) foundation is to support the license renewal function of the RWST. The purpose of the pipe tunnel is to house the associated piping between the refueling water tanks and the auxiliary building. The RWST is used to fill the refueling canal for refueling operations. It is normally aligned to the suction of the safety injection pumps and the residual heat removal pumps for the ECCS function, the safety injection pumps, and the containment spray pumps. The RWST piping tunnel is part of the ABSCE boundary which provides the function of an isolation barrier during certain postulated accidents involving airborne radioactive contamination to limit off-site exposure.

The Unit 1 RWST foundation supports the 350,000-gallon stainless steel RWST. The RWST is a Category I tank but is not qualified for a tornadic event. Integral to the tank foundation, a storage basin or reservoir around the tank retains sufficient borated water in the event the tank is ruptured by a tornado missile or other initiating event. The RWST foundation is comprised of a reinforced concrete slab founded on engineered compacted backfill. Shear keys under the foundation slab assure no sliding displacement. The RWST sits on a steel ring plate that has steel shear lugs welded to the bottom of the ring plate and keyed into the concrete foundation slab. The tank is secured to the concrete foundation slab by anchor bolts.

A rainwater diversion skirt is located over the RWST storage basin/reservoir to channel rainwater onto the sloped concrete apron extending outward from the storage basin/reservoir. The rainwater diversion skirt is self supporting and comprised of a corrugated sheet steel roof supported by structural steel framing. The rainwater diversion skirt is a Category I(L) structure and is within the scope of license renewal per 10 CFR 54.4(a)(2).

The pipe tunnel housing the piping between the RWST and the auxiliary building are reinforced concrete box-type structures. The top of the pipe tunnel is located approximately 18 inches below plant grade with earthen material above the top slab.

The Unit 1 RWST foundation and pipe tunnel have the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- 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 safety-related systems, structures, and components that prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10 CFR 100. 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)

The Unit 1 RWST foundation and pipe tunnel have no intended function for 10 CFR 54.4(a)(3).

Refueling Water Storage Tank Foundation and Pipe Tunnel, Unit 2

The purpose of the Unit 2 refueling water storage tank (RWST) foundation is to support the license renewal function of the RWST. The purpose of the pipe tunnel is to house the associated piping between the refueling water tanks and the auxiliary building. The RWST is used to fill the refueling canal for refueling operations. It is normally aligned to the suction of the residual heat removal pumps for the ECCS function, the safety injection pumps, and the containment spray pumps. The RWST piping tunnel is part of the ABSCE boundary which provides the function of an isolation barrier during certain postulated accidents involving airborne radioactive contamination to limit off-site exposure.

The Unit 2 RWST foundation supports the 350,000-gallon stainless steel RWST. The RWST is a Category I tank but is not qualified for a tornadic event. Integral to the tank foundation, a storage basin or reservoir around the tank retains sufficient borated water in the event the tank is ruptured by a tornado missile or other initiating event. The RWST foundation is comprised of a reinforced concrete slab founded on engineered compacted backfill. Shear keys under the foundation slab assure no sliding displacement. The RWST sits on a steel ring plate that has 60 equally spaced steel shear lugs welded to the bottom of the ring plate and keyed into the concrete foundation slab. The tank is secured to the concrete foundation slab with 60 equally spaced anchor bolts.

A rainwater diversion skirt is located over the RWST storage basin/reservoir to channel rainwater onto the sloped concrete apron extending outward from the storage basin/reservoir. The rainwater diversion skirt is self supporting and comprised of a corrugated sheet steel roof supported by structural steel framing. The rainwater diversion skirt is a Category I(L) structure and within the scope of license renewal per 10 CFR 54.4(a)(2).

The pipe tunnel housing the piping between the refueling water tanks and the auxiliary building are reinforced concrete box-type structures. The top of the pipe tunnel is located approximately 18-inches below plant grade with earthen material above the top slab.

The Unit 2 RWST foundation and pipe tunnel has the following intended functions for 10 CFR 54.4(a)(1) and (a)(2).

- 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 safety-related systems, structures, and components that prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to those referred to in 10 CFR 100. 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)

The Unit 2 RWST foundation and pipe tunnel has no intended function for 10 CFR 54.4(a)(3)

Transformer and Switchyard Support Structures and Foundations

The purpose of the transformer and switchyard support structures and foundations is to maintain their structural integrity during design basis events in support of the Commission's regulated event, station blackout (10 CFR 50.63).

SQN has two separate switchyards that provide the interface connection between the two reactor units and the electrical distribution grid. Unit 1 is connected to the 500-kV transmission system and Unit 2 is connected to the 161-kV transmission system. A common transformer yard is located west of the Units 1 and 2 turbine building. The switchyard and transformer yard foundations are reinforced concrete pedestals or piers 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 transformer yard and switchyards and are supported by the reinforced concrete pedestals or piers. Transmission and pull-off towers are steel tower structures supported on reinforced concrete pier foundations. The switchyards and the transformer yard have reinforced concrete cable tunnels below grade that provide a pathway for electrical cables that support power generation and the station blackout regulated event intended function.

These structures provide physical support to the transformer yard and switchyard components in the SBO offsite power recovery path. These support structures include the transformer foundations and foundations for the associated transformer yard and switchyard breakers, switchyard bus, and fused disconnect.

The offsite power source required to support SBO recovery is the Chickamauga No. 1 Line or Watts Bar Hydro Line, fed through one of the common station service transformers (CSST) A, B, C or D. Specifically, the path includes the 161-kV switchyard circuit breaker feeding the common station service transformer, the common station service transformer, the circuit breaker-to-transformer and transformer-to-onsite electrical distribution interconnections, and the associated control circuits and structures.

NRC guidance indicates that systems and structures relied upon to restore offsite AC power (including the on-site portion of the offsite power sources) and onsite AC power be included within the license renewal scope for SBO (10 CFR 50.63). Therefore, the transformer yard and switchyard supporting structures are considered within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(3).

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).

- Provide 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)

UFSAR References

Turbine Building

Section 3.8.4.1.1	Figure 1.2.3-1	Figure 1.2.3-5
Section 3.3.2.3	Figure 1.2.3-2	Figure 1.2.3-6
	Figure 1.2.3-3	Figure 1.2.3-8
	Figure 1.2.3-4	Figure 1.2.3-10

Auxiliary Control Building

Auxiliary Building

Section 3.8.4	Figure 1.2.3-1	Figure 1.2.3-5
Section 3.8.5	Figure 1.2.3-2	Figure 1.2.3-6
Section 6.2.1	Figure 1.2.3-3	Figure 1.2.3-8
Section 6.2.4	Figure 1.2.3-4	Figure 3.8.4-11

Control Bay

Section 3.1.2	Figure 1.2.3-1	Figure 1.2.3-5
Section 3.8.4.1.1	Figure 1.2.3-2	Figure 1.2.3-6
Section 3.8.5.1	Figure 1.2.3-3	Figure 1.2.3-8
	Figure 1.2.3-4	Figure 2.5.1-12

Additional Equipment Building, Unit 1 and Unit 2

Section 3.8.4	Figure 1.2.3-1	Figure 1.2.3-3
	Figure 1.2.3-2	Figure 1.2.3-4

Condensate Demineralizer Waste Evaporator Building

Section 3.8.4.1	Figure 1.2.3-7	Table 3.2.1-1
Section 3.8.5.1.2	Figure 2.5.1-12	

Waste Packaging Area

Section 3.8.4	Figure 1.2.3-4
Section 3.8.5.1.2	Figure 1.2.3-7

Additional Diesel Generator Building

Table 3.2.1-1

Carbon Dioxide Storage Building

None

Condensate Storage Tank Foundation and Pipe Trench

Section 9.2.6.2
Section 9.2.6.3

Diesel Generator Building

Section 2.5.5.3.2	Figure 1.2.3-17
Section 3.5.2.12	
Section 3.8.4.1.3	

East Steam Valve Room, Units 1 and 2

Section 3.5.5	Figure 1.2.3-1	Figure 1.2.3-4
Section 3.8.4.1.6	Figure 1.2.3-2	Figure 1.2.3-8
	Figure 1.2.3-3	

High Pressure Fire Protection Pump House and Water Storage Tanks' Foundations

None

Manhole, Handhole and Duct Banks

Section 3.5.5	Figure 3.8.4-5
Section 3.8.4.1.5	Figure 3.8.4-6
	Figure 3.8.4-8

Radiation Monitoring Station, Units 1 and 2

None

Refueling Water Storage Tank Foundation and Pipe Tunnel, Units 1 and 2

Section 3.8.4.1.4	Figure 3.8.4-3
Section 3.8.5.1.2	Figure 3.8.4-4

Transformer and Switchyard Support Structures and Foundations

Section 8.2.1

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, process facilities and yard 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 Buildings, Aux/Control Building, and Other Structures
Components Subject to Aging Management Review

Component	Intended Function
Steel and Other Metals	
Cranes rails	Support for Criterion (a)(2) equipment
Cranes structural girders	Support for Criterion (a)(2) equipment
Control room ceiling support system	Support for Criterion (a)(2) equipment
Explosion bolts	Pressure relief Support for Criterion (a)(1) equipment
Metal siding	Support for Criterion (a)(2) equipment
Monorails	Support for Criterion (a)(2) equipment
New fuel storage racks	Support for Criterion (a)(1) equipment
Pressure relief or blowout panels	Pressure relief
Roof decking or floor decking	Fire barrier Pressure relief Support for Criterion (a)(1) equipment
RWST rainwater diversion skirt	Support for Criterion (a)(2) equipment
Spent fuel pool gate	Support for Criterion (a)(1) equipment
Spent fuel pool liner plate	Support for Criterion (a)(1) equipment
Spent fuel storage racks	Shelter or protection Support for Criterion (a)(1) equipment
Steel H-bearing piles	Support for Criterion (a)(1) equipment
Steel plate missile barrier	Missile barrier
Structural steel: beams, columns, plates	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-3 (Continued)
Turbine Buildings, Aux/Control Building, and Other Structures
Components Subject to Aging Management Review

Component	Intended Function
Sump liners	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Transmission towers, Angle tower, Pull-off tower	Support for Criterion (a)(3) equipment
Concrete	
Concrete (accessible areas): interior and above-grade exterior	Fire barrier Flood barrier Missile barrier Pressure boundary Shelter or protection 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	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete (inaccessible areas); below-grade exterior; foundation	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Beams, columns, floor slabs and interior walls	Fire barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

**Table 2.4-3 (Continued)
Turbine Buildings, Aux/Control Building, and Other Structures
Components Subject to Aging Management Review**

Component	Intended Function
Cable tunnel	Missile barrier Support for Criterion (a)(3) equipment
Concrete slab (missile barrier)	Missile barrier
Duct banks	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Manholes and handholes	Fire barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Pipe tunnel	Missile barrier Pressure boundary Support for Criterion (a)(1) equipment
Precast bulkheads	Missile barrier Support for Criterion (a)(1) equipment
Roof slabs	Fire barrier Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
RWST storage basin	Support for Criterion (a)(1) equipment
Sumps	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-3 (Continued)
Turbine Buildings, Aux/Control Building, and Other Structures
Components Subject to Aging Management Review

Component	Intended Function
Trenches	Shelter or protection Support for Criterion (a)(2) equipment
Masonry walls	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Masonry walls (fire barriers)	Fire barrier

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.

UFSAR 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.) are included in this evaluation. Insulation is subject to aging management review if it performs an intended function as described above as well as seismic II/I supports.

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
Doors	Fire barrier Flood barrier Missile barrier Pressure boundary Shelter or protection
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	Fire barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Manways, hatches, manhole covers and hatch covers	Flood barrier Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Mirror insulation	Insulation Support for Criterion (a)(2) equipment
Missile shields	Missile barrier Shelter or protection

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
Miscellaneous steel (decking, framing, grating, handrails, ladders, enclosure plates, stairs, vents and louvers, framing steel, etc.)	Flood barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Penetration seals (end caps)	Fire barrier Flood barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Penetration sleeves (mechanical/ electrical not penetrating PC boundary)	Fire barrier Flood barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	Shelter or 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 and MC piping and components (Constant and variable load spring hangers; guides; stops)	Support for Criterion (a)(1) equipment Support for Criterion (a)(3) equipment

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
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
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
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

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Component	Intended Function
Manways, hatches, 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
Support pedestals	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
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	Fire barrier Flood barrier Pressure boundary Shelter or protection Support for Criterion (a)(2) equipment
Roof membranes	Shelter or protection Support for Criterion (a)(2) equipment
Seals and gaskets (doors, manways and hatches)	Flood barrier Pressure boundary Support for Criterion (a)(1) equipment
Seismic/expansion joint	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. The scoping boundaries of the offsite power system are described below.

LRA Drawing LRA-E-001 depicts the electrical interconnection between SQN and the offsite transmission network. LRA Drawing LRA-E-001 identifies major components or commodities associated with off-site power recovery following SBO. The highlighted portions depict the components that are subject to aging management review. The highlighted portions in the off-site power circuits are color-coded to distinguish between plant and switchyard components. The off-site power components that are not shown on this drawing 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). Agencywide Documents Access and Management System [ADAMS] accession number ML020920464.

UFSAR References

Additional details for electrical systems and commodities can be found in UFSAR 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.

The Unit 1 and Unit 2 preferred off-site power sources required to support SBO recovery are supplied from the 161-kV switchyard through three separate common station service transformers (CSSTs) to the onsite electrical distribution system (see LRA Drawing LRA-E-001).

The SQN 161-kV switchyard is the source of two physically and electrically independent circuits from the 161-kV switchyard through three separate transformers (CSSTs A, B, and C) to the onsite electrical distribution system. Specifically, the offsite power recovery path includes the six 161-kV switchyard circuit breakers (874, 878, 944, 948, 994, 998) feeding the CSSTs (A, B, or C). CSST B is connected to the 161-kV transmission system but does not normally carry load. In the event CSST A or C becomes unavailable, the loads supplied by that transformer transfer to transformer B. CSSTs (A, B, or C) are each capable of supplying power to the two 6.9-kV shutdown boards (1A-A, 1B-B, 2A-A, 2B-B) for each unit. Components in the 161-kV preferred off-site power paths consist of switchyard bus and connections, transmission conductors and connections, high-voltage insulators, 161-kV oil-filled cables and connections, control circuit cables and connections, metal-enclosed bus, and inaccessible power cables and connections with manholes.

Structures supporting breakers, disconnects, transformers, transmission conductors, and switchyard bus within the off-site power recovery paths are evaluated with structures in Section 2.4, Scoping and Screening Results: Structures. Steel transmission towers and foundations utilized in the 161-kV off-site power recovery path are also evaluated in Section 2.4.

Commodity Groups Subject to AMR

As discussed in Section 2.1.2.3.1, SQN 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
- 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
- Fuse holders – insulation material
- Fuse holders – metallic clamp
- Inaccessible power (400 V to 35 kV) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements
- Inaccessible power (161 kV) 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

Commodity Groups Not Subject to AMR

Electrical and I&C Penetration Assemblies

All SQN electrical and I&C penetration assemblies are in the EQ program (10 CFR 50.49). SQN 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.

Uninsulated Ground Conductors

A review of the SQN UFSAR 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. SQN uninsulated ground conductors limit equipment damage in the event of a circuit failure but do not perform a license renewal intended function. 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 (SOC) (60 FR 22467), 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 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[1]
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 (includes non-EQ electrical and I&C penetration conductors and connections)	Conducts electricity
Insulation material for electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	Conducts electricity
Fuse holders (not part of active equipment): insulation material	Conducts electricity
Fuse holders (not part of active equipment): metallic clamps	Conducts electricity
High voltage insulators (high voltage insulators for SBO recovery)	Insulation
Conductor insulation for inaccessible power cables (400 V to 35 kV) not subject to 10 CFR 50.49 EQ requirements	Conducts electricity
Metal enclosed bus: bus/connections	Conducts electricity
Metal enclosed bus: enclosure assemblies	Conducts electricity
Metal enclosed bus: external surface of enclosure assemblies	Conducts electricity
Metal enclosed bus: insulation; insulators	Insulation
161-kV oil-filled cable	Conducts electricity Insulation
161-kV oil-filled cable: reservoir tanks	Insulation
161-kV oil-filled cable: tubing, valves, instruments	Insulation
Switchyard bus and connections (switchyard bus for SBO recovery)	Conducts electricity
Transmission conductors (transmission conductors for SBO recovery)	Conducts electricity
Transmission connectors (transmission connectors for SBO recovery)	Conducts electricity

Table 2.5-1 (Continued)
Electrical and Instrumentation and Control Systems
Components Subject to Aging Management Review

Structure and/or Component/Commodity	Intended Function[1]
Connector contacts for electrical connectors exposed to borated water leakage	Conducts electricity

1. Intended functions are defined in Table 2.0-1.

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 safety injection system results are presented in Table 3.2.2-1, and the containment spray 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 SQN 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 SQN 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 safety injection, containment spray, residual heat removal, 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 (AERM), 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.

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

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 containment spray 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 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
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])

Table 3.0-1 (Continued)
Service Environments for Mechanical Aging Management Reviews

Environment	Description	Corresponding NUREG-1801 Environments
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)
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, 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 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.

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% 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 – indoor uncontrolled (temperature < 32°F)	An air-indoor uncontrolled environment with temperature less than 32°F and humidity up to 100%. This environment applies only to the ice condenser compartment of containment.	None
Air – outdoor	Exposed to the weather with air temperature less than 115°F, humidity up to 100%. This environment is subject to periodic wetting and wind.	Air – outdoor
Air with borated water leakage	An air-indoor uncontrolled environment with consideration of the potential for leakage from plant PWR systems that contain borated water.	Air with borated water leakage

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 SQN is defined as raw water or treated water. • Raw water – Water from the Tennessee river provides the source of raw water utilized at SQN. 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. SQN 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 (includes treated borated water, treated borated water > 140°F, treated water, treated water > 140°F) Water – flowing Water – standing
Soil	External environment for components buried in the soil, including groundwater in the soil. This environment is “non-aggressive” 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
Insulating oil	Highly-refined mineral oil that is stable at high temperatures and has excellent electrical insulating properties. Its functions are to insulate, and suppress corona and arcing. The dielectric properties of the oil must be maintained for the oil to perform its function.	NA – Not addressed in NUREG-1801
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)
- Miscellaneous RCS Components 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

Miscellaneous RCS Components in Scope for 10 CFR 54.4(a)(2)

- Table 3.1.2-5 Reactor Coolant System Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

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.

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
- 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
- Flux Thimble Tube Inspection
- Inservice Inspection
- Nickel Alloy 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.

- Cast austenitic stainless steel (CASS)
- Nickel alloy
- Stainless steel

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 stainless steel
- CASS
- Copper alloy
- Copper alloy >15% zinc or > 8% aluminum
- Nickel alloy
- Stainless steel

Environments

Reactor coolant pressure boundary components are exposed to the following environments.

- Air – indoor
- Lube oil
- Raw water
- Steam
- Treated borated water
- Treated borated water > 140ºF
- 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
- Fouling
- 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
- Service Water Integrity
- 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 > 140ºF
- Treated water
- Treated water > 140ºF

Aging Effects Requiring Management

The following aging effects associated with the steam generators require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the steam generator components.

- Bolting Integrity
- Boric Acid Corrosion
- Inservice Inspection

- One-Time Inspection
- Steam Generator Integrity
- Water Chemistry Control – Primary and Secondary

3.1.2.1.5 Miscellaneous 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 RCS components included in scope for 10 CFR 54.4(a)(2). Further details are provided in Table 3.1.2-5.

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
- Gas
- Lube oil
- Treated borated water > 140°F

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 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
- External Surfaces Monitoring
- Oil Analysis

- One-Time Inspection
- 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 SQN 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 reactor vessel internals are not part of the reactor coolant pressure boundary. Although not mandatory, fatigue analyses were performed for selected internals components. For those internals components analyzed, the evaluation of fatigue is discussed in Section 4.3.1.2. Cracking, including cracking due to fatigue, will be managed by the Reactor Vessel Internals Program for other internals components.

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 for both SQN units have been replaced with Westinghouse Model 57 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. For both SQN units, the original steam generators were entirely replaced with Westinghouse Model 57 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 vessel 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 and for maintaining untested capsules in storage for future reinsertion.

3. This paragraph in NUREG-1800 pertains to a plant-specific TLAA for Babcock and Wilcox (B&W) reactor internals and is therefore not applicable to SQN.

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. Growth of intergranular separations (underclad cracks) in the heat-affected zone under austenitic stainless steel cladding is a TLAA. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of underclad crack growth for the reactor vessel is discussed in Section 4.7.1.

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.

   Cracking of the bottom-mounted instrument guide tubes is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. The Water Chemistry Control – Primary and Secondary Program minimizes contaminants which promote SCC. The Inservice Inspection Program provides periodic pressure testing of these components.

2. Cracking due to SCC of CASS 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 volumetric 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 SQN steam generators do not have feedwater impingement plates.

3.1.2.2.9 Augmented Inspection Bases for PWR Vessel Internal Components

This section of NUREG-1800, as modified by LR-ISG-2011-04 (see Section 2.1.3), describes further evaluations required for reactor vessel internals aging management issues. These generic issues (addressed in Item A), and NSSS vendor specific issues (addressed in Items B, C and D) are based on MRP-227-A (Ref. 3.1-2).

A. *Further Evaluation "Acceptance Criteria" Recommendations for PWR Reactor Vessel Internals (RVI) Components – Generic Items*

   1. Response to A/LAIs on the MRP-227 Report

      Applicant/licensee action items (A/LAI) are identified in the NRC's safety evaluation report incorporated in MRP-227-A (Ref. 3.1-2). Responses to the A/LAI are provided in Appendix C. The A/LAI responses are reflected as appropriate in the sections of this LRA, including the aging management review results in Section 3.1, relevant TLAAs in Section 4, the UFSAR supplement in Appendix A, and the Reactor Vessel Internals Program description in Appendix B.

2. RVI Program and Inspection Plans for PWR RVI Components

   The Reactor Vessel Internals Program description is presented in Appendix B. The program addresses the ten program elements of NUREG-1801 AMP XI.M16A, "PWR Vessel Internals." Program elements have been enhanced as necessary to assure consistency with the NUREG-1801 program and the A/LAI responses regarding the design of SQN vessel internals components.

   The RVI inspection plan is included in Appendix C. The inspection plan includes no deviations from the MRP's proposed inspection and evaluation methodology.

3. PWR Vessel Internals Scoping and Inspection Category Review

   As described in the A/LAI responses in Appendix C, operation of the SQN units is consistent with the base-load and fuel load management assumptions in MRP-227-A (Ref. 3.1-2), and the SQN internals design includes no components beyond those identified in Table 4-4 of MRP-191 (Ref. 3.1-1). Consequently, the SQN Reactor Vessel Internals Program requires no component inspections other than those delineated in the MRP's recommended inspection criteria for Primary, Expansion and Existing program components in MRP-227-A, nor different component inspection categories from those identified in MRP-227-A.

4. Partially Inaccessible Components

   Inspection Coverage Considerations

   MRP-227-A (Ref. 3.1-2) identifies minimum inspection coverage requirements for Primary and Expansion components. For most inspections, 100 percent inspection of accessible components or component surfaces, and 75 percent inspection of the entire (accessible and inaccessible) population of redundant components or surface area is required. Where these general coverage requirements do not apply, MRP-227-A provides relevant guidance for the scope of inspection. As stated in Section 4.3 of MRP-227-A, there are no specified examinations where inadequate coverage is anticipated to be an issue.

   TVA expects to meet the examination coverage requirements for Primary components in Table 4-3 of MRP-227-A when those inspections are performed. Although detailed inspection procedures and tooling must still be developed, there are currently no known issues that will prevent inspection of

75 percent of all (accessible and inaccessible) surfaces/components where specified for the Primary components in Table 4-3.

TVA also expects to meet the examination coverage requirements for Expansion components in Table 4-6 of MRP-227-A if and when those inspections are performed. Achieving 75 percent coverage for the Expansion components will require careful planning and may require the development of new tooling, but the lead time (from detection of Primary component indications to required inspection of Expansion components) will provide sufficient opportunity to prepare for the inspections.

Exact accessibility conditions for both Primary and Expansion component inspections may depend on the configuration of available inspection equipment and outage conditions. Although unusual circumstances may arise during the inspections, most accessibility issues should be identified and resolved before the inspections take place.

If TVA determines that the examinations will not meet the specified coverage criteria, the condition will be entered in the corrective action program for disposition. The condition will be addressed as a deviation under the NEI 03-08 protocols and will include NRC notification. The process and type of evaluation that will be implemented to evaluate the impact of the aging effects on the inaccessible regions of the components will be determined as part of the deviation response under NEI 03-08.

Evaluation of Inspection Indications with Respect to Inaccessible Surfaces/ Components

Inspection indications that do not meet established acceptance criteria will initiate an evaluation under the corrective actions program. Extrapolating the effect of indications found on accessible surfaces/components to inaccessible surfaces/components will depend on the type and distribution of indications found. For example, if indications are found in a random distribution and with no reason to suspect different conditions in the inaccessible surfaces/ components, then a direct extrapolation would be appropriate. If the indications are clustered in a region near inaccessible surfaces/components or in a region sharing attributes of inaccessible surfaces/components, then extrapolation may be inappropriate. In any case, the event-specific evaluation would include a determination of how to assess the impact of the indications on the inaccessible surfaces/component's ability to perform their intended functions.

Operating experience at other Westinghouse plants, reported in accordance with Section 7.6 of MRP-227-A, will support the development of criteria and processes for evaluating specific component indication combinations. TVA anticipates that evaluation processes and criteria will be available for typical indications before inspections occur at SQN.

5. Reinspection Frequencies

   The SQN Reactor Vessel Internals Program is consistent with MRP-227-A (Ref. 3.1-2) recommendations including examination frequency guidance. No changes are proposed to the inspection intervals specified in MRP-227-A.

6. Thermal Aging Embrittlement

   Components composed of CASS, martensitic stainless steel (martensitic SS), or precipitation-hardened stainless steel (PH SS) materials may be susceptible to a reduction of fracture toughness due to thermal aging embrittlement. Of the reactor vessel internals components that require aging management, only the lower core support plate (called lower support casting in NUREG-1801) is composed of one of these susceptible materials.

   Consistent with MRP-227-A (Ref. 3.1-2) and A/LAI 7, the CASS lower core support plates for SQN Unit 1 and Unit 2 have been evaluated for susceptibility to thermal aging embrittlement. Based on the certified material test reports and the determination of susceptibility to reduction in fracture toughness due to thermal embrittlement described in NUREG/CR-4513 (Ref. 3.1-3), the lower core support plates are not subject to reduction in fracture toughness. The response to A/LAI 7 is presented in Appendix C.

7. Use of VT-3 Visual Inspection Techniques for Detection of Cracking

   Consistent with MRP-227-A (Ref. 3.1-2) recommendations, VT-3 visual inspection techniques will be used to detect effects of cracking in three Primary (baffle edge bolts, baffle former assembly, thermal shield flexures) and one Expansion (BMI column bodies) component sets. All are redundant component sets where the intended function of the overlying assembly does not rely upon and would not be impacted by a single component failure in the component population.

   VT-3 visual inspection techniques are appropriate to detect the effects of cracking for these inspections. In each case, the inspection relies on detection of gross effects of cracking rather than detection of crack initiation. Prior to the performance of each of these inspections, the number of allowable component failures and allowable failure configurations (e.g., allowable bolting failure patterns) will be identified as inspection acceptance criteria. TVA anticipates that these criteria will be developed jointly, for multiple plants, but will be established specifically for SQN if necessary.

8. Impact of Applicable Technical Specification Requirements or Operating License Requirements on Aging Management Programs for PWR RVI Components

   No specific reactor vessel internals inspections are mandated by the SQN operating license or technical specifications. Consequently, no technical specification changes are required or requested for license renewal.

9. Identification of TLAAs for PWR-Design RVI Components

   As described in Section 3.1.2.2.1, TLAAs applicable to reactor vessel internals components are addressed in Section 4.3. The Reactor Vessel Internals Program is not credited as the basis for demonstrating acceptability of TLAAs in accordance with 10 CFR 54.21(c)(1)(iii).

B. *Further Evaluation "Acceptance Criteria" Recommendations for PWR RVI Components – Recommendations Applicable to Westinghouse-NSSS Designs*

1. Westinghouse-Design CRGT Support Pins

   The original nickel alloy control rod guide tube (CRGT) support pins (split pins) have been replaced with stainless steel pins in both SQN units. As described in the response to A/LAI 3 in Appendix C, SQN installed the third generation of split pins in the fall of 2001 for Unit 1 and spring of 2002 for Unit 2. The new split pins were qualified for 40 years from the time of installation, which encompasses the extended period of operation. No vendor recommended inspections are required to support this qualification.

2. Westinghouse-Design Hold-Down Springs

   SQN Unit 1 uses a stainless steel Type 304 hold-down spring, while Unit 2 uses a stainless steel Type 403 hold-down spring. As described in the response to A/LAI 5 in Appendix C, plant-specific acceptance criteria for hold-down springs will be developed prior to the first required physical measurement. The acceptance criteria will be sufficiently conservative to assure the hold-down springs remain functional between successive measurements and provide the required hold-down force under all licensing basis conditions.

C. *Further Evaluation "Acceptance Criteria" Recommendations for PWR RVI Components – Recommendations Applicable to Combustion Engineering (CE-NSSS) Designs*

These sections of NUREG-1800 apply to CE NSSS designs only.

D. *Further Evaluation "Acceptance Criteria" Recommendations for PWR RVI Components – Recommendations Applicable to Babcock and Wilcox NSSS (B&W-NSSS) Designs*

These sections of NUREG-1800 apply to B&W NSSS designs only.

3.1.2.2.10 Loss of Fracture Toughness due to Neutron Irradiation Embrittlement, Change in Dimension due to Void Swelling, Loss of Preload due to Stress Relaxation, or Loss of Material due to Wear

Loss of fracture toughness due to neutron irradiation embrittlement, change in dimension due to void swelling, loss of preload due to stress relaxation, or loss of material due to wear in inaccessible locations for stainless steel and nickel-alloy PWR reactor vessel internal components is addressed in Section 3.1.2.2.9, Item A, Part 6.

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 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 SQN replacement steam generators do not use Alloy 600 materials. There is no Alloy 600 material in the primary head of the SQN Unit 2 steam generators. The SQN Unit 2 divider plate assembly is fabricated of Alloy 690. In the SQN Unit 1 steam generators, Alloy 600 clad material is used as a buffer zone between austenitic stainless steel clad on the primary head and the Alloy 690 clad near the divider plate attachment welds. The Alloy 600 clad is limited to 0.5 inches in width where it contacts the base metal of the primary head and is separated from the divider plate by Alloy 690 clad material. The small amount of Alloy 600 clad material is in a low stress region and, based on previous experience with Alloy 600 clad material, is not considered susceptible to cracking. Cracking of the nickel alloy divider plate assemblies and cladding exposed to reactor coolant is managed by the Water Chemistry Control – Primary and Secondary Program.

2. Cracking due to PWSCC could occur in steam generator nickel alloy tube-to-tubesheet welds exposed to reactor coolant. The SQN replacement steam generators use Alloy 690TT 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 Cracking due to Fatigue

This paragraph in NUREG-1800 (now addressed in Section 3.1.2.2.9, Item C) pertains to cracking due to fatigue for reactor vessel internals designed by Combustion Engineering. The SQN reactors were designed by Westinghouse.

3.1.2.2.13 Cracking due to Stress Corrosion Cracking and Fatigue

This paragraph in NUREG-1800 pertains to cracking due to stress corrosion cracking and fatigue in nickel alloy control rod guide tube assemblies and guide tube support pins. The SQN control rod guide tube assemblies and guide tube support pins are stainless steel and are addressed in Section 3.1.2.2.9, Item B, Part 1.

3.1.2.2.14 Loss of Material due to Wear

This paragraph in NUREG-1800 pertains to loss of material due to wear in nickel alloy control rod guide tube assemblies and guide tube support pins, and in CE-designed Zircaloy-4 incore instrumentation lower thimble tubes. The SQN control rod guide tube assemblies and guide tube support pins are stainless steel and are addressed in Section 3.1.2.2.9, Item B, Part 1. The Westinghouse SQN reactor internals design does not use Zircaloy-4 incore instrumentation lower thimble tubes.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of SQN quality assurance procedures and administrative controls for aging management programs.

3.1.2.3 Time-Limited Aging Analyses

TLAAs identified for the reactor coolant system include reactor vessel neutron embrittlement and metal fatigue, including underclad crack growth. 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.

3.1.4 References

3.1-1 *Materials Reliability Program: Screening, Categorization, and Ranking of Reactor Internals Components for Westinghouse and Combustion Engineering PWR Design (MRP-191)*. EPRI, Palo Alto, CA: 2006. 1013234.

3.1-2 *Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)*. EPRI, Palo Alto, CA: 2011. 1022863.

3.1-3 *Estimation of Fracture Toughness of Cast Stainless Steels During Thermal Aging in LWR Systems*. NUREG/CR-4513, ANL-93/22. Revision 1. May 1994.

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 [NUREG-1800], 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.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 Sections 3.1.2.2.1 and 3.1.2.2.9, Item A, Part 9
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 SQN reactor vessels do not use support skirts.
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.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-6	BWR only				
3.1.1-7	BWR only				
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. 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**
3.1.1-9	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.
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				

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 SQN replacement steam generators are Model 57. See Section 3.1.2.2.2, Items 1 and 2
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

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 (including CASS, martensitic SS, and PH SS) and nickel alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Reduction in 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 for meeting the requirements of 10 CFR 54.21(c)(1).	Yes, TLAA	The SQN reactor vessel internals have no TLAA for the reduction in ductility and fracture toughness due to neutron irradiation 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	Growth of underclad cracks in the low-alloy steel forging heat affected zone under stainless steel cladding is a TLAA. 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. Cracking of the bottom-mounted instrument guide tubes is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. 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 SQN steam generators do not have steel steam generator feedwater impingement plates. See Section 3.1.2.2.8

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-23	Stainless steel or nickel alloy PWR reactor vessel internal components (inaccessible locations) exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, and irradiation-assisted stress corrosion cracking, and fatigue	Chapter XI.M16A, “PWR Vessel Internals," and Chapter XI.M2, “Water Chemistry”	Yes, evaluate inaccessible areas for impact on intended functions if accessible Primary, Expansion or Existing program components indicate aging effects that need management	This item was not used since the aging management review was not performed on the basis of component accessibility. However, cracking of inaccessible reactor vessel internals components will be managed by the Reactor Vessel Internals and Water Chemistry Control – Primary and Secondary Programs. See Section 3.1.2.2.9, Item A, Part 4

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-24	Stainless steel (including CASS, martensitic SS, and PH SS) or nickel alloy PWR reactor vessel internal components (inaccessible locations) exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement; and for CASS, martensitic SS, or PH SS due to thermal aging embrittlement or changes in dimension 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"	Yes, evaluate inaccessible areas for impact on intended functions if accessible Primary, Expansion or Existing Program components indicate aging effects that need management	This item was not used since the aging management review was not performed on the basis of component accessibility. However, loss of fracture toughness, changes in dimension, loss of preload, and loss of material due to wear of inaccessible reactor vessel internals components will be managed by the Reactor Vessel Internals Program. See Section 3.1.2.2.9, Item A, Part 4

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 other nickel alloy components 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

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-26	Stainless steel Combustion Engineering core support barrel assembly: lower flange weld exposed to reactor coolant and neutron flux; upper internals assembly: fuel alignment plate (applicable to CE plants with core shrouds assembled with full height shroud plates) exposed to reactor coolant and neutron flux; and lower support structure: core support plate (applicable to CE plants designed with a core plate) exposed to reactor coolant and neutron flux	Cracking due to fatigue; loss of fracture toughness due to neutron irradiation embrittlement (for core support plates)	Chapter XI.M16A, "PWR Vessel Internals," (and additionally Chapter XI.M2, "Water Chemistry," if there is a plant-specific basis for concluding cracking may also initiate by either stress-corrosion cracking, irradiation-assisted stress-corrosion cracking or intergranular attack mechanisms)	Yes, evaluate to determine whether cracking due to fatigue can be adequately managed by a fatigue analysis TLAA.	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item C.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-27	Westinghouse control rod guide tube (CRGT) assemblies,: nickel alloy guide tube support pins (split pins) exposed to reactor coolant and neutron flux	Cracking due to stress-corrosion cracking and fatigue and loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	Yes, further evaluation of Westinghouse-design CRGT support pins (split pins) is recommended.	The SQN control rod guide tube assemblies and guide tube support pins are stainless steel. Cracking and loss of material are managed by the Reactor Vessel Internals Program with the Water Chemistry Control – Primary and Secondary Program to supplement management of cracking. See Section 3.1.2.2.9, Item B, Part 1
3.1.1-27a	Westinghouse alignment and interfacing components: austenitic stainless steel hold down springs exposed to reactor coolant and neutron flux	Loss of preload due to thermal and irradiation enhanced stress relaxation; loss of material due to wear	Chapter XI.M16A, "PWR Vessel Internals"	Yes, further evaluation of the physical measurement monitoring basis is necessary	SQN Unit 1 uses Type 304 stainless steel hold-down spring. Unit 2 uses a Type 403 stainless steel hold-down spring. Loss of preload and loss of material due to wear of the Unit 1 hold-down spring are managed by the Reactor Vessel Internals Program. See Section 3.1.2.2.9, Item B, Part 2

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-28	Zircaloy-4 Combustion Engineering incore instrumentation (ICI): thimble tubes exposed to reactor coolant and neutron flux and Stainless steel Combustion Engineering Core support barrel assembly: thermal shield positioning pins 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”	Yes, further evaluation of CE-design ICI thimble tubes and thermal shield positioning pins is recommended (See SRP-LR Sections 3.1.2.2.9.C.5)	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item C

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-28a	Combustion Engineering Lower support structure: stainless steel (A-286 is normal type) fuel alignment pins exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement; or changes in dimension due to void swelling; or loss of preload due to thermal and irradiation enhanced stress relaxation or creep; or loss of material due to wear; or cracking due to stress-corrosion cracking	Chapter XI.M16A, “PWR Vessel Internals”	Yes, further evaluation of CE-design fuel alignment pins is recommended (See SRP-LR Section 3.1.2.2.9.C.4)	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item C
3.1.1-28b	Combustion Engineering control element assemblies (CEA): stainless steel or nickel alloy instrument guide tubes exposed to reactor coolant and neutron flux	Cracking due to stress-corrosion cracking or fatigue	Chapter XI.M2, "Water Chemistry," and Chapter XI.M16A, "PWR Vessel Internals."	Yes, further evaluation of CEA instrument guide tubes is recommended (See SRP-LR Section 3.1.2.2.9.C.1).	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item C

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-28c	Combustion Engineering core shroud assemblies (applicable to welded core shroud designs assembled in vertical segments); stainless steel core shrouds exposed to reactor coolant and neutron flux	Cracking due to stress-corrosion cracking or fatigue; changes in dimension due to distortion or void swelling; loss of fracture toughness due to neutron irradiation embrittlement	Chapter XI.M16A, "PWR Vessel Internals."	Yes, further evaluation is recommended to define the physical measurement method that will be used to inspect the gap area in these types of core shroud designs (See SRP-LR Section 3.1.2.2.9.C.2).	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item C
3.1.1-29	BWR only				
3.1.1-30	BWR only				
3.1.1-31	BWR only				
3.1.1-32	Stainless steel, nickel alloy, or CASS reactor vessel internals, core support structure components, 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”	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, Subsections IWB as required. These AMR results are compared to other table items (3.1.1-53 and 3.1.1-59).

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 core support pads 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 cladding and stainless steel pressurizer components is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. SQN uses recirculating steam generators.
3.1.1-43	BWR only				
3.1.1-44	Steel steam generator secondary manways and handholds (cover only) exposed to air with leaking secondary-side water and/ or steam	Loss of material due to erosion	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD” for Class 2 components	No	A leaking closure seal is an event driven condition that is not expected to occur with proper maintenance. However, ASME Section XI Class 2 pressure testing requirements apply to the secondary side closures of the SQN steam generators.

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 [Inservice Inspection] 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 (other than Alloy 600) components, cracking is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs.
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	Consistent with NUREG-1801. Cracking of stainless steel safe ends and welds is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. These programs are supplemented by the Nickel Alloy Inspection Program for nickel alloy (Alloy 600) components.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 stainless head penetrations, safe ends and welds is managed by the Inservice Inspection and Water Chemistry Control – Primary and Secondary Programs. The nickel alloy components are compared to item 3.1.1-46.
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.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
3.1.1-51	Stainless steel or nickel-alloy Babcock & Wilcox reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals," and Chapter XI.M2, “Water Chemistry”	No component-specific further evaluation recommendations for the components within this commodity group.	The SQN reactors were designed by Westinghouse.
3.1.1-52	Stainless steel or nickel-alloy Combustion Engineering reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals," and Chapter XI.M2, “Water Chemistry”	No component-specific further evaluation recommendations for the components within this commodity group.	The SQN reactors were designed by Westinghouse.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-53	Stainless steel or nickel-alloy Westinghouse reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, irradiation-assisted stress corrosion cracking, or fatigue	Chapter XI.M16A, “PWR Vessel Internals," and Chapter XI.M2, “Water Chemistry”	No component-specific further evaluation recommendations for the components within this commodity group.	Consistent with NUREG-1801. Cracking of accessible and inaccessible reactor vessel internals components is managed by the Reactor Vessel Internals and Water Chemistry Control – Primary and Secondary Programs using the inspection frequencies specified by MRP-227-A. Where used, VT-3 inspections will be adequate to detect the relevant effects of cracking as required. See Section 3.1.2.2.9, Item A, Parts 4, 5 and 7.
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	Consistent with NUREG-1801. The flux thimble tubes are evaluated with the reactor vessel. Loss of material due to wear of the flux thimble tubes is managed by the Flux Thimble Tube Inspection Program.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-55	Stainless steel core thermal shield assembly, thermal shield flexures exposed to reactor coolant and neutron flux	Cracking due to fatigue; Loss of material due to wear	Chapter XI.M16A, “PWR Vessel Internals”	No.	Consistent with NUREG-1801. Cracking and loss of material due to wear of accessible and inaccessible portions of the thermal shield flexures are managed by the Reactor Vessel Internals Program. Where used, VT-3 inspections will be adequate to detect the relevant effects of cracking as required. See Section 3.1.2.2.9, Item A, Parts 4 and 7

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-56	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel-alloy Combustion Engineering 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 dimension due to void swelling; 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 component-specific further evaluation recommendations for the components within this commodity group.	The SQN reactors were designed by Westinghouse.
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
3.1.1-58	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel-alloy Babcock & Wilcox 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 dimension due to void swelling; 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 component-specific further evaluation recommendations for the components within this commodity group.	The SQN reactors were designed by Westinghouse.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-59	Stainless steel (SS, including CASS, PH SS or martensitic SS) or nickel-alloy Westinghouse 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 dimension due to void swelling; 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 component-specific further evaluation recommendations for the components within this commodity group.	Consistent with NUREG-1801. Loss of fracture toughness (for susceptible types of stainless steel), changes in dimension, loss of preload and loss of material due to wear of accessible and inaccessible reactor vessel internals components are managed by the Reactor Vessel Internals Program using the inspection frequencies specified by MRP-227-A. See Section 3.1.2.2.9, Item A, Parts 4, 5 and 6.
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	The steam generator outlet nozzles use nickel alloy flow inserts which protects the steel nozzle from flow-accelerated corrosion (FAC). The feedwater nozzles contain an alloy steel (Cr-Mo) 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 bolting is managed by the Bolting Integrity Program. Other than the vessel closure studs, there is no high-strength low alloy steel closure bolting in the reactor coolant pressure boundary.
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.
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	SQN does not use bolting for the control rod drive head penetration flange.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 and stainless steel closure bolting is managed by the Bolting Integrity Program. Other than the vessel closure studs, there is no high-strength low alloy steel closure bolting in the reactor coolant pressure boundary.
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 and stainless steel closure bolting is managed by the Bolting Integrity Program.
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 SQN replacement steam generators do not use steel tube support plates.
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.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 U-bend support components is managed by the Steam Generator Integrity and Water Chemistry Control – Primary and Secondary Programs.
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 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 SQN replacement steam generators do not use steel tube support plates.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-73	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	SQN 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 SQN 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 SQN replacement steam generators do not use steel tube support lattice bars.
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 U-bend support components is managed by the Steam Generator Integrity Program.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-77	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	The SQN replacement steam generators have no secondary side nozzles made of nickel alloy.
3.1.1-79	BWR only				
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 relief tank 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**
3.1.1-81	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	Consistent with NUREG-1801. Cracking of stainless steel 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.
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	The pressurizer spray head components are made of stainless steel.
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				

Table 3.1.1: Reactor Coolant System					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 for most components. 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. Loss of material of the stainless steel reactor vessel closure head flange leak detection line will be managed by the One-Time Inspection Program.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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				
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 high-strength low alloy steel closure head stud assembly is managed by the Reactor Head Closure Studs Program.
3.1.1-93	Copper alloy >15% Zn or > 8% Al piping, piping components, and piping elements exposed to closed cycle cooling water	Loss of material due to selective leaching	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.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 OE [operating experience] 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 AEM [aging effect/ mechanism] or AMP	Consistent with NUREG-1801.
3.1.1-107	Stainless steel piping, piping components and piping element exposed to gas, concrete, air with borated water leakage, air – indoors, uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-108	Stainless steel Babcock and Wilcox Core support assembly: upper flange welds exposed to reactor coolant and neutron flux	Cracking due to stress-corrosion cracking; loss of fracture toughness due to neutron irradiation embrittlement	Chapter XI.M16A, "PWR Vessel Internals"	Yes, basis for aging management is dependent on whether the IPA confirms a weld heat treatment / stress relief process was performed as part of the initial weld fabrication process.	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item D

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-109	Babcock and Wilcox core barrel assemblies: internal baffle-to-baffle bolts, external baffle-to- baffle bolts and their locking devices, core barrel-to-former bolts and their locking devices, former plates, and core barrel cylinder axial and circumferential welds exposed to reactor coolant and neutron flux	Cracking due to stress-corrosion cracking; loss of fracture toughness due to neutron irradiation embrittlement; loss of preload due to irradiation-assisted stress relaxation or creep; and loss of materials due to wear	Chapter XI.M16A, “PWR Vessel Internals”	Yes, further evaluation of the basis for managing the relevant aging effects is recommended for these “Expansion Category” components. (See SRP-LR Section 3.1.2.2.9.D.2)	The SQN reactors were designed by Westinghouse. See Section 3.1.2.2.9, Item D

<u>Notes for Tables 3.1.2-1 through 3.1.2-5</u>

<u>Generic Notes</u>

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.

<u>Plant-Specific Notes</u>

101. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – Primary and Secondary Program.

102. High component surface temperature precludes moisture accumulation that could result in corrosion.

103. This component is not composed of Alloy 600/82/182 materials.

104. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

105 The parenthetical note used on this and subsequent lines of this table indicate the relevant Reactor Vessel Internals Program inspection group for the components: (P) indicates primary, (E) indicates expansion, (X) indicates existing, and (N) indicates no additional measures.

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 Program	NUREG-1801 Item	Table 1 Item	Notes
Reactor vessel components	Pressure boundary	Stainless steel, Nickel alloy, Carbon steel clad with stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.A2.R-219 IV.A2.R-85	3.1.1-10 3.1.1-18	A
Reactor vessel components • Stud assemblies	Pressure boundary	Carbon steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.A2.RP-54	3.1.1-1	A
Bolting • CETNA assembly hold-down nuts/ compression collar • Canopy seal cap screws	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.A2.R-80	3.1.1-66	A
Bottom mounted instrumentation • Flux thimble guide tubes • Seal table	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

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bottom mounted instrumentation • Flux thimble guide tubes • Seal table	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-154	3.1.1-19	E
Bottom mounted instrumentation • Flux thimble guide tubes • Seal table	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Bottom mounted instrumentation • Flux thimble tubes and bullet plugs	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
Bottom mounted instrumentation • Flux thimble tubes and bullet plugs	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material – wear	Flux Thimble Tube Inspection	IV.B2.RP-284	3.1.1-54	A
Bottom mounted instrumentation • Flux thimble tubes and bullet plugs	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	3.1.1-33	C

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bottom mounted instrumentation • Flux thimble tubes and bullet plugs	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Closure head • Closure head 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
Closure head • Closure head 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.RP-344	3.1.1-33	C
Closure head • Closure head dome	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion Nickel Alloy Inspection	IV.A2.RP-379	3.1.1-48	A
Closure head • Top head ring	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 Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Closure head • Top head ring	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.RP-344	3.1.1-33	C
Closure head • Top head ring	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Closure head • Auxiliary head adapter • Vent pipe penetration • CRDM housing penetration • Auxiliary head adapter canopy seal weld overlay	Pressure boundary	Nickel alloy	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 Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Closure head • Auxiliary head adapter • Vent pipe penetration • CRDM housing penetration • Auxiliary head adapter canopy seal weld overlay	Pressure boundary	Nickel alloy	Treated borated water (int)	Cracking	Inservice Inspection Nickel Alloy Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-186 IV.A2.RP-234	3.1.1-45 3.1.1-46	A
Closure head • Auxiliary head adapter • Vent pipe penetration • CRDM housing penetration • Auxiliary head adapter canopy seal weld overlay	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Closure head • Auxiliary head adapter cap • Vent pipe penetration safe end and weld	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	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Closure head • Auxiliary head adapter cap • Vent pipe penetration safe end and weld	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	C
Closure head • Auxiliary head adapter cap • Vent pipe penetration safe end and weld	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Closure head • Dummy cans	Structural	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Closure head • Flange	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
Closure head • Flange	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

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Closure head • Flange	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.RP-344	3.1.1-33	C
Closure head • Flange	Pressure boundary Structural support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Closure head • Studs • Nuts • Washers	Pressure boundary	Carbon 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
Closure head • Studs • Nuts • Washers	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material – wear	Reactor Head Closure Studs	IV.A2.RP-53	3.1.1-92	A
Closure head • Studs • Nuts • Washers	Pressure boundary	Carbon steel	Air – indoor (ext)	Cracking	Reactor Head Closure Studs	IV.A2.RP-52	3.1.1-92	A

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Control rod drive penetration adapters • CRDM housing adapter • CRDM latch housing • CRDM rod travel housing • CETNA • Head adapter plugs • Canopy seal assembly	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	A
Control rod drive penetration adapters • CRDM housing adapter • CRDM latch housing • CRDM rod travel housing • CETNA • Head adapter plugs • Canopy seal assembly	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

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Control rod drive penetration adapters • CRDM housing adapter • CRDM latch housing • CRDM rod travel housing • CETNA • Head adapter plugs • Canopy seal assembly	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Nozzles • 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 • 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.RP-344	3.1.1-33	C
Nozzles • Inlet / outlet	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Nozzle • Inlet / outlet safe ends and welds	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	A

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Nozzle • Inlet / outlet safe ends and welds	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-234	3.1.1-46	A
Nozzle • Inlet / outlet safe ends and welds	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Vessel external attachments • Vessel support pads • Vent shroud support lugs	Structural support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Vessel internal attachments • Core support pads	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 support pads	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

Table 3.1.2-1: Reactor Vessel

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Vessel shell (including welds) • Upper shell • Intermediate shell • Lower shell • Bottom head ring	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 (including welds) • Upper shell • Intermediate shell • Lower shell • Bottom head ring	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.RP-344	3.1.1-33	C
Vessel shell (including welds) • Upper shell • Intermediate shell • Lower shell • Bottom head ring	Pressure boundary	Carbon steel clad with stainless steel	Treated borated water > 140°F (int) Neutron fluence	Reduction of fracture toughness	Reactor Vessel Surveillance TLAA – neutron fluence	IV.A2.RP-229 IV.A2.R-84	3.1.1-14 3.1.1-13	A
Vessel shell (including welds) • Upper shell • Intermediate shell • Lower shell • Bottom head ring	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 Program	NUREG-1801 Item	Table 1 Item	Notes
Vessel shell • Vessel 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
Vessel shell • Vessel 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
Vessel shell • Vessel 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.RP-344	3.1.1-33	C
Vessel shell • Vessel flange	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Vessel shell (including welds) • Bottom head spherical ring	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 (including welds) • Bottom head spherical ring	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.RP-344	3.1.1-33	C

Table 3.1.2-1: Reactor Vessel								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Vessel shell (including welds) • Bottom head spherical ring	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.A2.R-17	3.1.1-49	A
Bottom head • Bottom head cap	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
Bottom head • Bottom head cap	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.RP-344	3.1.1-33	C
Bottom head • Bottom head cap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion Nickel Alloy Inspection	IV.A2.RP-379	3.1.1-48	A
Bottom head cap • Instrumentation tubes and welds	Pressure boundary	Nickel alloy	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 Program	NUREG-1801 Item	Table 1 Item	Notes
Bottom head cap • Instrumentation tubes and welds	Pressure boundary	Nickel alloy	Treated borated water (int)	Cracking	Inservice Inspection Nickel Alloy Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-59 IV.A2.RP-234	3.1.1-45 3.1.1-46	A C
Bottom head cap • Instrumentation tubes and welds	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Bottom head cap • Instrumentation tubes safe ends	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	A
Bottom head cap • Instrumentation tubes safe ends	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.A2.RP-234	3.1.1-46	A
Bottom head cap • Instrumentation tubes safe ends	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	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	Stainless steel, Nickel alloy, CASS	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.B2.RP-303a	3.1.1-3	A
Reactor vessel internal connectors components (with the exception of those noted in subsequent table entries): • Bolts • Studs • Nuts • Washers • Locking bars • Locking caps • Locking keys • Dowels • Cap screws	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A, 105
				Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
				Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
				Loss of preload	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
				Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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 connectors components: • Baffle-to-former bolts • Baffle edge bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (P)	IV.B2.RP-272 IV.B2.RP-354	3.1.1-59 3.1.1-59	A
Reactor vessel internal connectors components: • Baffle-to-former bolts • Baffle edge bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B2.RP-271 IV.B2.RP-275	3.1.1-53 3.1.1-53	A
Reactor vessel internal connectors components: • Baffle-to-former bolts • Baffle edge bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Reactor vessel internal connectors components: • Baffle-to-former bolts • Baffle edge bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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 connectors components: • Baffle-to-former bolts • baffle edge bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (P)	IV.B2.RP-272 IV.B2.RP-354	3.1.1-59 3.1.1-59	A
Reactor vessel internal connectors components: • Baffle-to-former bolts • Baffle edge bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B2.RP-272 IV.B2.RP-354	3.1.1-59 3.1.1-59	A
Reactor vessel internal connectors components: • Barrel-to-former bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (E)	IV.B2.RP-274	3.1.1-59	A
Reactor vessel internal connectors components: • Barrel-to-former bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-273	3.1.1-53	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 connectors components: • Barrel-to-former bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Reactor vessel internal connectors components: • Barrel-to-former bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Reactor vessel internal connectors components: • Barrel-to-former bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (E)	IV.B2.RP-274	3.1.1-59	A
Reactor vessel internal connectors components: • Barrel-to-former bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B2.RP-274	3.1.1-59	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 connectors components: • BMI column nuts • BMI column bolts • Thermal shield bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
				Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
				Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
				Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
				Loss of preload	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
				Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Reactor vessel internal connectors components: • Clevis insert bolts	Structural support	Nickel alloy	Treated borated water	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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 connectors components: • Clevis insert bolts	Structural support	Nickel alloy	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Reactor vessel internal connectors components: • Clevis insert bolts	Structural support	Nickel alloy	Treated borated water	Loss of material – wear	Reactor Vessel Internals (X)	IV.B2.RP-285	3.1.1-59	A
Reactor vessel internal connectors components: • Lower support column bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Reactor vessel internal connectors components: • Lower support column bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-286	3.1.1-53	A
Reactor vessel internal connectors components: • Lower support column bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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
Reactor vessel internal connectors components: • Lower support column bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Reactor vessel internal connectors components: • Lower support column bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (E)	IV.B2.RP-287	3.1.1-59	A
Reactor vessel internal connectors components: • Lower support column bolts	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B2.RP-287	3.1.1-59	A
Upper Core Support Assembly								
Control rod guide tube assembly and downcomer: • Upper guide tube enclosures • Housing plates • Water flow slot ligaments	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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
Control rod guide tube assembly and downcomer: • Upper guide tube enclosures • Housing plates • Water flow slot ligaments	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Control rod guide tube assembly and downcomer: • C-tubes • Enclosure pins • Sheaths	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Control rod guide tube assembly and downcomer: • C-tubes • Enclosure pins • Sheaths	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Control rod guide tube assembly and downcomer: • C-tubes • Enclosure pins • Sheaths	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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**
Control rod guide tube assembly and downcomer: • Guide cards and plates	Structural support	CASS	Treated borated water > 482°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Control rod guide tube assembly and downcomer: • Guide cards and plates	Structural support	CASS	Treated borated water > 482°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Control rod guide tube assembly and downcomer: • Guide cards and plates	Structural support	CASS	Treated borated water > 482°F	Loss of material – wear	Reactor Vessel Internals (P)	IV.B2.RP-296	3.1.1-59	A
Control rod guide tube assembly and downcomer: • Guide cards and plates	Structural support	CASS	Treated borated water > 482°F	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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**
Control rod guide tube assembly and downcomer: • Guide tube support pins (split pins)	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (X) Water Chemistry Control – Primary and Secondary	IV.B2.RP-355	3.1.1-27	A
Control rod guide tube assembly and downcomer: • Guide tube support pins (split pins)	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Control rod guide tube assembly and downcomer: • Guide tube support pins (split pins)	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (X)	IV.B2.RP-356	3.1.1-27	A
Control rod guide tube assembly and downcomer: • Guide tube support pins (split pins)	Structural support	Stainless steel	Treated borated water > 140°F	Loss of preload	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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
Control rod guide tube assembly and downcomer: • Flanges intermediate	Structural support	CASS	Treated borated water > 482°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Control rod guide tube assembly and downcomer: • Flanges intermediate	Structural support	CASS	Treated borated water > 482°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Control rod guide tube assembly and downcomer: • Flanges intermediate	Structural support	CASS	Treated borated water > 482°F	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Control rod guide tube assembly and downcomer: • Flanges lower	Structural support	CASS	Treated borated water > 482°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B2.RP-298	3.1.1-53	C
Control rod guide tube assembly and downcomer: • Flanges lower	Structural support	CASS	Treated borated water > 482°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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
Control rod guide tube assembly and downcomer: • Flanges lower	Structural support	CASS	Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B2.RP-297	3.1.1-59	C
Control rod guide tube assembly and downcomer: • Lower flange welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B2.RP-298	3.1.1-53	A
Control rod guide tube assembly and downcomer: • Lower flange welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Control rod guide tube assembly and downcomer: • Lower flange welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B2.RP-297	3.1.1-59	A
Upper head injection: • Flow column	Structural support Flow distribution	CASS	Treated borated water > 482°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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 head injection: • Flow column	Structural support Flow distribution	CASS	Treated borated water > 482°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Upper head injection: • Flow column	Structural support Flow distribution	CASS	Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Upper core plate and fuel alignment pins: • Upper core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-291b	3.1.1-53	A
Upper core plate and fuel alignment pins: • Upper core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Upper core plate and fuel alignment pins: • Upper core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (E)	IV.B2.RP-290b	3.1.1-59	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 core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Upper core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Upper core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Upper support column assembly: • Adapters • Column bodies • Extension tubes • Flanges	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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 support column assembly: • Adapters • Column bodies • Extension tubes • Flanges	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Upper support column assembly: • Column bases	Structural support	CASS	Treated borated water > 482°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Upper support column assembly: • Column bases	Structural support	CASS	Treated borated water > 482°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Upper support column assembly: • Column bases	Structural support	CASS	Treated borated water > 482°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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 support plate assembly: • Flange • Upper support plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Upper support plate assembly: • Flange • Upper support plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Upper support plate assembly: • Upper support plate ring or skirt	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (X) Water Chemistry Control – Primary and Secondary	IV.B2.RP-346	3.1.1-53	A
Upper support plate assembly: • Upper support plate ring or skirt	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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 Core Support Structure								
Baffle and former assembly: • Baffle plates • Former plates and corner brackets	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (P)	IV.B2.RP-270	3.1.1-59	A
Baffle and former assembly: • Baffle plates • Former plates and corner brackets	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.B2.RP-270a	3.1.1-53	A
Baffle and former assembly: • Baffle plates • Former plates and corner brackets	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Baffle and former assembly: • Baffle plates • Former plates and corner brackets	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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 barrel: • Upper core barrel flange (base metal)	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Core barrel: • Upper core barrel flange (base metal)	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Core barrel: • Upper core barrel flange (base metal)	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (X)	IV.B2.RP-345	3.1.1-53 3.1.1-59	A
Core barrel: • Upper core barrel flange weld • Lower core barrel flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B2.RP-276 IV.B2.RP-280	3.1.1-53 3.1.1-53	A
Core barrel: • Upper core barrel flange weld • Lower core barrel flange weld	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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 barrel: • Core barrel outlet nozzle welds • Upper and lower core barrel axial (vertical) welds	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-278 IV.B2.RP-387a	3.1.1-53 3.1.1-53	A
Core barrel: • Core barrel outlet nozzle welds • Upper and lower core barrel axial (vertical) welds	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Core barrel: • Core barrel outlet nozzle welds • Upper and lower core barrel axial (vertical) welds	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B2.RP-278a IV.B2.RP-388a	3.1.1-59 3.1.1-59	A
Core barrel: • Lower core barrel • Upper core barrel	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.B2.RP-265	3.1.1-53	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 barrel: • Lower core barrel • Upper core barrel	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Core barrel: • Lower core barrel • Upper core barrel	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Core barrel: • Upper core barrel and lower core barrel circumferential (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.B2.RP-387	3.1.1-53	A
Core barrel: • Upper core barrel and lower core barrel circumferential (girth) welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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 barrel: • Upper core barrel and lower core barrel circumferential (girth) welds	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (P)	IV.B2.RP-388	3.1.1-59	A
Diffuser plate: • Diffuser plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Diffuser plate: • Diffuser plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Head cooling spray nozzles: • Head cooling spray nozzles	Flow distribution	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Head cooling spray nozzles: • Head cooling spray nozzles	Flow distribution	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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 core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Lower core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Lower core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Lower core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Lower core plate and fuel alignment pins: • Fuel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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 core plate and fuel alignment pins: • Lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Lower core plate and fuel alignment pins: • Lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (X) Water Chemistry Control – Primary and Secondary	IV.B2.RP-289	3.1.1-53	A
Lower core plate and fuel alignment pins: • Lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Lower core plate and fuel alignment pins: • Lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (X)	IV.B2.RP-288	3.1.1-59	A
Lower core plate and fuel alignment pins: • Lower core plate	Structural support Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (X)	IV.B2.RP-288	3.1.1-59	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 column assemblies: • Lower support column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Lower support column assemblies: • Lower support column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-294	3.1.1-53	A
Lower support column assemblies: • Lower support column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Lower support column assemblies: • Lower support column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B2.RP-295	3.1.1-59	A
Lower support column assemblies: • Lower support column sleeve	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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 column assemblies: • Lower support column sleeve	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Lower core support plate	Structural support	CASS	Treated borated water > 482°F	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-291a	3.1.1-53	A
Lower core support plate	Structural support	CASS	Treated borated water > 482°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Lower core support plate	Structural support	CASS	Treated borated water > 482°F	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B2.RP-290a	3.1.1-59	A
Thermal shield: • Thermal shield	Structural support Shielding Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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
Thermal shield: • Thermal shield	Structural support Shielding Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Thermal shield: • Thermal shield	Structural support Shielding Flow distribution	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Thermal shield: • Thermal shield flexures	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (P) Water Chemistry Control – Primary and Secondary	IV.B2.RP-302	3.1.1-55	A
Thermal shield: • Thermal shield flexures	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Thermal shield: • Thermal shield flexures	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (P)	IV.B2.RP-302	3.1.1-55	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**
Thermal shield: • Thermal shield flexures	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Thermal shield: • Thermal shield flexures	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Radial support keys: • Radial support keys	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Radial support keys: • Radial support keys	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Radial support keys: • Radial support keys	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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
Secondary core support assembly: • Secondary core support plate • Secondary core support energy absorber • Secondary core support guide posts • Secondary core support housing	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Secondary core support assembly: • Secondary core support plate • Secondary core support energy absorber • Secondary core support guide posts • Secondary core support housing	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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**
Interfacing components: • Clevis inserts	Structural support	Nickel alloy	Treated borated water	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Interfacing components: • Clevis inserts	Structural support	Nickel alloy	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Interfacing components: • Clevis inserts	Structural support	Nickel alloy	Treated borated water	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Interfacing components: • Head and vessel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Interfacing components: • Head and vessel alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 304 Unit 1)	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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**
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 304 Unit 1)	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 304 Unit 1)	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (P)	IV.B2.RP-300	3.1.1-27a	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 304 Unit 1)	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (P)	IV.B2.RP-300	3.1.1-27a	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 304 Unit 1)	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 403 Unit 2)	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	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**
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 403 Unit 2)	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 403 Unit 2)	Treated borated water > 140°F Neutron fluence	Loss of material – wear	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 403 Unit 2)	Treated borated water > 140°F Neutron fluence	Loss of preload	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Interfacing components: • Internals hold-down spring	Structural support	Stainless steel (Type 403 Unit 2)	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
Interfacing components: • Upper core plate alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (X) Water Chemistry Control – Primary and Secondary	IV.B2.RP-301	3.1.1-53	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
Interfacing components: • Upper core plate alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
Interfacing components: • Upper core plate alignment pins	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material – wear	Reactor Vessel Internals (X)	IV.B2.RP-299	3.1.1-59	A
Incore Instrumentation Support Structure								
Upper instrumentation conduit and supports • Brackets • Clamps • Terminal blocks • Conduit straps	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Upper instrumentation conduit and supports • Brackets • Clamps • Terminal blocks • Conduit straps	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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 instrumentation conduit and supports: • Conduit seal assembly • Body • Tube sheets • Tubes • Conduits • Flange bases • Support tubes	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
Upper instrumentation conduit and supports: • Conduit seal assembly • Body • Tube sheets • Tubes • Conduits • Flange bases • Support tubes	Structural support	Stainless steel	Treated borated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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**
BMI column bodies • BMI column collars • BMI column extension bars • BMI column extension tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
BMI column bodies • BMI column collars • BMI column extension bars • BMI column extension tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
BMI column bodies • BMI column collars • BMI column extension bars • BMI column extension tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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**
BMI column bodies • BMI column collars • BMI column extension bars • BMI column extension tubes	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
BMI column bodies • BMI column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
BMI column bodies • BMI column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (E) Water Chemistry Control – Primary and Secondary	IV.B2.RP-293	3.1.1-53	A
BMI column bodies • BMI column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.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**
BMI column bodies • BMI column bodies	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (E)	IV.B2.RP-292	3.1.1-59	A
BMI column bodies • BMI column cruciforms	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Change in dimensions	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	A
BMI column bodies • BMI column cruciforms	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Cracking	Reactor Vessel Internals (N) Water Chemistry Control – Primary and Secondary	IV.B2.RP-265	3.1.1-53	A
BMI column bodies • BMI column cruciforms	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Loss of material	Water Chemistry Control – Primary and Secondary	IV.B2.RP-24	3.1.1-87	A
BMI column bodies • BMI column cruciforms	Structural support	Stainless steel	Treated borated water > 140°F Neutron fluence	Reduction of fracture toughness	Reactor Vessel Internals (N)	IV.B2.RP-267	3.1.1-59	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**
RCS components	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, stainless steel, nickel alloy, CASS, carbon steel clad with 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Cracking	Bolting Integrity	IV.C2.R-11	3.1.1-62	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	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**
Flex connection	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Flex connection	Pressure boundary	Nickel alloy	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-159	3.1.1-45	A, 103
Flex connection	Pressure boundary	Nickel alloy	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Heat exchanger (channel head) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	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 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, 104
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 coil (thermal barrier)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-383	3.1.1-80	C, 101
Heat exchanger coil (thermal barrier)	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 coil (thermal barrier)	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 coil (thermal barrier)	Heat transfer	Stainless steel	Treated borated water > 140°F (ext)	Fouling	Water Chemistry Control – Primary and Secondary	V.D1.E-20	3.2.1-19	C, 101
Heat exchanger coil (thermal barrier)	Heat transfer	Stainless steel	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C
Heat exchanger (shell) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Heat exchanger (shell) (RCP upper oil cooler)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 104

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 (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, 104
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, 104
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
Heat exchanger (tubes) (RCP motor air cooler)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger (channel head) (RCP motor air cooler)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	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 (channel head) (RCP motor air cooler)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.A.EP-90	3.2.1-23	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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
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
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 wells and heater sheath to well welds	Pressure boundary	Stainless steel	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**
Pressurizer heater wells and heater sheath to well welds	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 wells and heater sheath to well welds	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
Manway cover	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Manway insert plate	Pressure boundary	Stainless steel	Steam (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
Manway insert plate	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Pressurizer nozzles (spray nozzle, surge nozzle, relief and safety nozzle)	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

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, relief and 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
Pressurizer nozzles (spray nozzle, surge nozzle, relief and 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 nozzle to safe-end welds including weld overlays	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Pressurizer nozzle to safe-end welds including weld overlays	Pressure boundary	Nickel alloy	Treated borated water (int)	Cracking	Inservice Inspection Nickel Alloy Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-156	3.1.1-45	A
Pressurizer nozzle to safe-end welds including weld overlays	Pressure boundary	Nickel alloy	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
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 (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	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	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	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

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 > 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
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

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 > 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	IV.C2.RP-23	3.1.1-88	A
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

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)	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) (RCP lower oil cooler)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.E.EP-38	3.2.1-8	A
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) (reactor vessel 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) (reactor vessel 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) (reactor vessel flange leak off lines)	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	One-Time Inspection	IV.C2.RP-23	3.1.1-88	E

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	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Piping, ≥ 4" NPS	Pressure boundary	Nickel alloy	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
Piping, ≥ 4" NPS	Pressure boundary	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 instrument penetration	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Pressurizer instrument penetration	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 instrument penetration	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
Pressurizer shell and heads	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
Pressurizer shell and heads	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 heads	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	CASS	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-41	3.1.1-81	A, 101
Pressurizer spray head	Flow control	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
Pressurizer spray head	Flow control	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
Pressurizer spray head coupling and locking bar	Flow control	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	IV.C2.RP-41	3.1.1-81	A, 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**
Pressurizer spray head coupling and locking bar	Flow control	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
Pump casing (RCP and flange)	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Pump casing (RCP and flange)	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 and flange)	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 and flange)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C2.R-08	3.1.1-38	A
Safe end (spray, surge, relief and safety)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Safe end (spray, surge, relief and safety)	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

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 (spray, surge, relief and safety)	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
Scoop to coolant loop weld (spray line and RTD)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	3.1.1-33	A
Scoop to coolant loop weld (spray line and RTD)	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
Scoop to coolant loop weld (spray line and RTD)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	3.1.1-33	A
Scoop to coolant loop weld (spray line and RTD)	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
Support	Structural Support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Support lug	Structural Support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Support skirt	Structural Support	Carbon steel	Air – indoor (ext)	Cracking	Inservice Inspection	IV.C2.R-19	3.1.1-36	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
Support skirt	Structural Support	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Thermal barrier	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Thermal barrier	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
Thermal barrier	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
Thermal sleeve (piping, spray, surge)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	3.1.1-33	A
Thermal sleeve (piping, spray, surge)	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
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	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**
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	3.1.1-33	A
Thermowell	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
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 (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	A
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	3.1.1-33	A
Tubing	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	Treated borated water > 140°F (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.C2.RP-344	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 < 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**
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 (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.RP-344	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

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	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
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	A, 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	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C2.R-08	3.1.1-38	C
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	IV.C2.RP-23	3.1.1-88	A
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	IV.C2.RP-23	3.1.1-88	A

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, Carbon steel clad with stainless steel or nickel alloy	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-18	3.1.1-5	C
Steam generator components	Pressure boundary	Stainless steel, Nickel alloy, Carbon steel clad with stainless steel or nickel alloy	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
Steam generator components	Pressure boundary	Carbon steel, Stainless steel, Nickel alloy	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

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
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	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	A
Tubesheet	Pressure boundary	Carbon steel clad with nickel alloy	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	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-36	3.1.1-45	C, 103
Tubesheet	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	C
Tubesheet	Pressure boundary	Carbon steel clad with nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	H
Tube to tubesheet weld	Pressure boundary	Nickel alloy	Treated borated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-385	3.1.1-25	E

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 to tubesheet weld	Pressure boundary	Nickel alloy	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Primary head	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Primary head	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy	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 head	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy	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 divider plate and divider bar	Pressure boundary	Nickel alloy	Treated borated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.D1.RP-367	3.1.1-25	A
Primary divider plate and divider bar	Pressure boundary	Nickel alloy	Treated borated water	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
Primary nozzle	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 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.D1.RP-232	3.1.1-33	A
Primary 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	C
Primary nozzle safe end	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Primary nozzle safe end	Pressure boundary	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 nozzle safe end	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
Primary nozzle-to-safe end weld	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	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 nozzle-to-safe end weld	Pressure boundary	Nickel alloy	Treated borated water (int)	Cracking	Inservice Inspection Water Chemistry Control – Primary and Secondary	IV.D1.RP-36	3.1.1-45	A, 103
Primary nozzle-to-safe end weld	Pressure boundary	Nickel alloy	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Nozzle dam clamp ring	Pressure boundary	Nickel alloy	Treated borated water	Cracking	Water Chemistry Control – Primary and Secondary	IV.D1.RP-367	3.1.1-25	C
Nozzle dam clamp ring	Pressure boundary	Nickel alloy	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Primary nozzle/ manway drain tubes	Pressure boundary	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 nozzle/ manway drain tubes	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

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	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Primary manway	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy	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 manway	Pressure boundary	Carbon steel clad with stainless steel or nickel alloy	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 manway cover plate	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.D1.R-17	3.1.1-49	A
Gasket retainer/ diaphragm insert plate	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	A
Gasket retainer/ diaphragm insert plate	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

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	Pressure boundary	Nickel alloy	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	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	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	Treated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	H
Tubes	Pressure boundary	Nickel alloy	Treated water (ext)	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-233	3.1.1-77	A
Tubes	Heat transfer	Nickel alloy	Treated borated water (int)	None	None	--	--	H
Tubes	Heat transfer	Nickel alloy	Treated water (ext)	None	None	--	--	H

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 plugs	Pressure boundary	Nickel alloy	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	Treated borated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.C2.RP-23	3.1.1-88	C
Stabilizers	Structural support	Stainless steel	Treated borated water > 140°F	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	C
Stabilizers	Structural support	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
Secondary shell (top head and steam outlet nozzle, upper, intermediate and lower shells and shell cone)	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102

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 shell (top head and steam outlet nozzle, upper, intermediate and lower shells and shell 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
Flow limiter insert	Flow control	Nickel alloy	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	C
Flow limiter insert	Flow control	Nickel alloy	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, 102
Feedwater nozzle	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101
Feedwater nozzle safe end	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Feedwater nozzle safe end	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101

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**
Feedwater nozzle thermal liner	Pressure boundary	Carbon steel	Treated water	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101
Instrument and drain nozzles	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Instrument and drain nozzles	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101
Blowdown nozzle	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Blowdown nozzle	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101
Secondary manway, handholes, inspection ports, recirculation nozzle and cover plates	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102

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, handholes, inspection ports, recirculation nozzle and cover plates	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	IV.D1.RP-372	3.1.1-83	C, 101
Secondary manway, handholes, inspection ports, recirculation nozzle and cover plate gasket sealing surfaces	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Secondary manway, handholes, inspection ports, recirculation nozzle and cover plate gasket sealing surfaces	Pressure boundary	Nickel alloy	Treated water (int)	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, 102

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**
Small nozzle shim and clamp (SQN Unit 1)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Upper bundle (U-bend) support components (I-beam, arch plates, tube support bars and related 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
Upper bundle (U-bend) support components (I-beam, arch plates, tube support bars and related components)	Structural integrity	Carbon steel	Treated water	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-225	3.1.1-76	A
Upper bundle (U-bend) support components	Structural integrity	Nickel alloy	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	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**
Upper bundle (U-bend) support components	Structural integrity	Nickel alloy	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	A
Upper bundle (U-bend) support components	Structural integrity	Nickel alloy	Treated water	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-225	3.1.1-76	A
Upper bundle (U-bend) support 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	A
Upper bundle (U-bend) support 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	A
Upper bundle (U-bend) support components	Structural integrity	Stainless steel	Treated water > 140°F	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
ATSG strips	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
ATSG strips	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
ATSG strips	Structural integrity	Stainless steel	Treated water > 140°F	Loss of material – wear	Steam Generator Integrity	IV.D1.RP-225	3.1.1-76	A
Upper and lower scalloped bar (SQN Unit 2)	Structural integrity	Nickel alloy	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	A
Upper and lower scalloped bar (SQN Unit 2)	Structural integrity	Nickel alloy	Treated water	Loss of material	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-226	3.1.1-71	A
Upper and lower scalloped bar (SQN Unit 2)	Structural integrity	Nickel alloy	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**
ATSG 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
Shroud, shroud supports and attachments	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 piping and support 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	C
Feedwater piping and support 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	C
Feedwater inserts, spray pipes and caps	Structural integrity	Nickel alloy	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**
Feedwater inserts, spray pipes and caps	Structural integrity	Nickel alloy	Treated water	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	C, 101
Blowdown pipe	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
Blowdown pipe	Structural integrity	Stainless steel	Treated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 101
Blowdown pipe support 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	C
Separator support plate, stiffener rib and manway 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	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**
Marman coupling	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
Marman coupling	Structural integrity	Stainless steel	Treated water > 140°F	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 101
Steam separators and supports	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	C
Steam separator swirl vanes (spinners)	Structural integrity	Nickel alloy	Treated water	Cracking	Steam Generator Integrity Water Chemistry Control – Primary and Secondary	IV.D1.RP-384	3.1.1-71	C
Steam separator swirl vanes (spinners)	Structural integrity	Nickel alloy	Treated water	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	C, 101

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**
Dryer support plate and related 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	C
Steam dryer frame, end plates and vanes	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	C
Steam dryer drains	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	C
Trunnion	Structural support	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Support pads	Structural support	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102

Table 3.1.2-5
Reactor Coolant System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.1.2-5: 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 material	Bolting Integrity	IV.C2.RP-166	3.1.1-64	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.RP-167	3.1.1-49	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C2.R-12	3.1.1-66	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 104
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.E.E-44	3.2.1-40	C

Table 3.1.2-5: 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**
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 104
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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.A.E-12	3.2.1-20	C, 101
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-223	3.1.1-9	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	C, 101
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 104
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	V.A.E-12	3.2.1-20	C, 101

Table 3.1.2-5: 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**
Rupture disc	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-223	3.1.1-9	C
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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 104
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F.EP-15	3.2.1-60	C
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F.EP-16	3.2.1-60	C
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	IV.C2.R-17	3.1.1-49	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 104
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	C

Table 3.1.2-5: 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
Tank	Pressure boundary	Stainless steel	Gas (int)	None	None	IV.E.RP-07	3.1.1-107	C
Tank	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	A, 101
Tank	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
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	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	C, 101
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-223	3.1.1-9	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	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	V.A.E-12	3.2.1-20	C, 101

Table 3.1.2-5: 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**
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-223	3.1.1-9	C
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.E.E-44	3.2.1-40	C
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 104
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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-80	3.2.1-50	C, 104
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	C, 101

Table 3.1.2-5: 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	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C2.R-223	3.1.1-9	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	C, 101

3.2 ENGINEERED SAFETY FEATURES SYSTEMS

3.2.1 Introduction

This section provides the results of the aging management reviews for components in the engineered safety features (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).

- Safety Injection (Section 2.3.2.1)
- Containment Spray (Section 2.3.2.2)
- Residual Heat Removal (Section 2.3.2.3)
- Containment Penetrations (Section 2.3.2.4)
- Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.2.5)

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 Safety Injection System—Summary of Aging Management Evaluation
- Table 3.2.2-2 Containment Spray System—Summary of Aging Management Evaluation
- Table 3.2.2-3 Residual Heat Removal System—Summary of Aging Management Evaluation
- Table 3.2.2-4 Containment Penetrations—Summary of Aging Management Evaluation

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

- Table 3.2.2-5-1 Safety Injection System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.2.2-5-2 Containment Spray System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.2.2-5-3 Residual Heat Removal 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 Safety Injection

Materials

Safety injection system components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with stainless steel
- Cast iron
- Stainless steel

Environments

Safety injection system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Gas
- Lube oil
- Raw water
- Soil
- 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
- Fouling
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the safety injection system components.

- Aboveground Metallic Tanks
- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Oil Analysis
- One-Time Inspection
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.2 Containment Spray

Materials

Containment spray system components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with stainless steel
- Stainless steel

Environments

Containment spray system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Lube oil
- Raw water
- Treated borated water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the containment spray system require management.

- Cracking
- Fouling
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the containment spray system components.

- Bolting Integrity
- Boric Acid Corrosion
- Buried and Underground Piping and Tanks Inspection
- External Surfaces Monitoring
- Oil Analysis
- One-Time Inspection
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.3 Residual Heat Removal

Materials

Residual heat removal system components are constructed of the following materials.

- Carbon steel
- Carbon steel clad with stainless steel
- Stainless steel

Environments

Residual heat removal system components are exposed to the following environments.

- Air – indoor
- Treated borated water > 140ºF
- Treated water
- Treated water > 140ºF

Aging Effects Requiring Management

The following aging effects associated with the residual heat removal system require management.

- Cracking
- Cracking – fatigue
- Fouling
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the residual heat removal system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.4 Containment Penetrations

Materials

Containment penetrations components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Stainless steel

Environments

Containment penetrations components are exposed to the following environments.

- Air – indoor
- Condensation
- Gas
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the containment penetrations require management.

- 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
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection

- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.2.2.1.5 Miscellaneous 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 3.2.2-5-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Carbon steel
- Elastomer
- Glass
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Gas
- Lube oil
- 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.

- Change in material properties
- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – wear
- 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

- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- 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 SQN 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 SQN charging pump casings have been replaced with 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. The refueling water storage tanks are the only outdoor stainless steel tanks included in the scope of license renewal. The refueling water storage tanks are built on a circular concrete foundation with the tank bottom resting on soil. The Aboveground Metallic Tanks Program manages loss of material for the bottom surface of the refueling water storage tank using periodic measurements of the thickness of the tank bottom.

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. The outside air at the SQN site is not conducive to loss of material in stainless steel. The SQN site is not near a saltwater coastline, and nearby highways are treated only infrequently with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The SQN cooling tower water is not treated with chlorine or chlorine compounds. The SQN site is in an isolated location, away from agricultural or industrial sources of

chloride contamination. Nevertheless, consistent with NUREG-1801, loss of material for stainless steel components directly exposed to outdoor air is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program. For stainless steel components exposed to outdoor air but located in a pipe tunnel, the Buried and Underground Piping and Tanks Inspection Program manages loss of material. At SQN, there are no 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 the chemical and volume control system (CVCS) charging pumps (evaluated in Table 3.3.2-10) which provide high head coolant injection as part of the emergency core cooling systems. Loss of material due to erosion of the mini-flow recirculation orifices will be managed by the Periodic Surveillance and Preventive Maintenance Program using periodic visual or other NDE inspections.

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. The outside air at the SQN site is not conducive to cracking in stainless steel. The SQN site is not near a saltwater coastline, and nearby highways are treated only infrequently with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The SQN cooling tower water is not treated with chlorine or chlorine compounds. The SQN site is in an isolated location, away from agricultural or industrial sources of chloride contamination. Nevertheless, consistent with NUREG-1801, cracking of stainless steel components directly exposed to outdoor air is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring or Aboveground Metallic Tanks Programs. For stainless steel components exposed to outdoor air but located in a pipe tunnel, the Buried and Underground Piping and Tanks Inspection Program manages cracking. At SQN, there are no 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 SQN quality assurance procedures and administrative controls for aging management programs.

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 [IN] 94- 63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant-specific program addresses clad breach	The SQN charging pump casings have been replaced with solid stainless steel casings. 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	The Aboveground Metallic Tanks Program manages loss of material for the bottom surface of the refueling water storage tank (AMR results presented in Table 3.2.2-1), as discussed in Table 3.4.1, Item 3.4.1-31. 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	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program. For stainless steel components exposed to outdoor air but located in a pipe tunnel, the Buried and Underground Piping and Tanks Inspection Program manages loss of material. See Section 3.2.2.2.3, Item 2.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 [high pressure safety injection] HPSI pump for normal charging. See [Licensee Event Report] LER 50-275/94-023 for evidence of erosion.	Yes, plant- specific	Loss of material due to erosion of the stainless steel mini-flow recirculation orifices of the chemical and volume control system (evaluated in Table 3.3.2-10) will be managed by the Periodic Surveillance and Preventive Maintenance Program. 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	Consistent with NUREG-1801. Cracking of stainless steel components exposed to outdoor air is managed by the External Surfaces Monitoring Program. For stainless steel components exposed to outdoor air but located in a pipe tunnel, the Buried and Underground Piping and Tanks Inspection Program manages cracking. For stainless steel tanks exposed to outdoor air, cracking is managed by the Aboveground Metallic Tanks Program. 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	Consistent with NUREG-1801 for copper alloy (> 15% Zn or > 8% Al) components exposed to air with borated water leakage. Loss of material for these components is managed by the Boric Acid Corrosion Program. There are no aluminum ESF components exposed to air with borated water leakage, 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**
3.2.1-9	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	Consistent with NUREG-1801. Reduction of fracture toughness for CASS components exposed to treated borated water > 250°C (> 482°F) is managed by the Thermal Aging Embrittlement of CASS Program. This item applies to the chemical and volume control system heat exchanger shell evaluated in Table 3.3.2-10.
3.2.1-11	BWR only				
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	There is no high-strength steel closure bolting in the ESF systems.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 and stainless steel closure bolting exposed to indoor or 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.
3.2.1-14	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	Consistent with NUREG-1801. 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.
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. Fouling of stainless steel heat exchanger tubes exposed to treated borated water is managed by the Water Chemistry Control – Primary and Secondary. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control Program to manage fouling. Fouling, as used in the SQN aging management review, is equivalent to the NUREG-1801 aging effect of 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 SQN safety injection accumulators 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	Consistent with NUREG-1801. Loss of material for steel ESF system components exposed to raw water is managed by the Service Water Integrity Program.
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, other than the heat exchanger components compared to Item 3.2.1-25 below.
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	Consistent with NUREG-1801. Loss of material for stainless steel ESF system heat exchanger components exposed to raw water is managed by the Service Water Integrity Program.
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	Consistent with NUREG-1801. Fouling for stainless steel ESF system heat exchanger tubes exposed to raw water is managed by the Service Water Integrity Program.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-28	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	Consistent with NUREG-1801. Cracking of stainless steel components exposed to closed-cycle cooling water > 140°F is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
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	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.
3.2.1-30	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. Fouling 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 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.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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	Consistent with NUREG-1801. Loss of material in steel components exposed to external condensation is managed by the External Surfaces Monitoring Program.

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 most 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 other components, loss of material from the internal surfaces of steel components is managed by the Periodic Surveillance and Preventive Maintenance 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 SQN 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 SQN containment spray system does not use encapsulation components.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Loss of material for stainless steel auxiliary systems components (Table 3.3.2-16) internally exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
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 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. Fouling of steel, stainless steel and copper alloy 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 fouling.
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. The refueling water storage tank is compared to Table 3.4.1, Item 3.4.1-31.

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	Loss of material for stainless steel piping components in an underground pipe chase is managed by the Buried and Underground Piping and Tanks Inspection Program. However, the environment is conservatively considered outdoor air, so these components are addressed in Item 3.2.1-4. There are no steel or nickel alloy underground ESF system 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.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	There are no aluminum ESF system components exposed to indoor air in the scope of license renewal.
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.
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.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 glass components exposed to indoor air and lube oil. There are no glass ESF system components exposed to other environments in the scope of license renewal.
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	There are no nickel alloy ESF system components exposed to indoor air in the scope of license renewal.
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	There are no nickel alloy ESF system components exposed to indoor air 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**
3.2.1-63	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 stainless steel components exposed to indoor air, air with borated water leakage and gas. There are no stainless steel ESF system components embedded in concrete in the scope of license renewal.
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	Consistent with NUREG-1801 for steel components exposed to gas. There are no steel ESF system components exposed to controlled indoor air in the scope of license renewal.

Notes for Tables 3.2.2-1 through 3.2.2-5-3

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 the 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.

203. This piping is in the containment spray header risers where the water level is maintained during normal operation. Periodic wetting and drying can concentrate contaminates which increase the potential for cracking.

Table 3.2.2-1
Safety Injection System
Summary of Aging Management Evaluation

Table 3.2.2-1: Safety Injection 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	V.E.EP-70	3.2.1-13	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	V.E.EP-64	3.2.1-13	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-118	3.2.1-15	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202

Table 3.2.2-1: Safety Injection 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	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
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	Cast iron	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Heat exchanger (shell)	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-1: Safety Injection 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	Cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-92	3.2.1-30	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	C
Heat exchanger (shell)	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Heat exchanger (shell)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-80	3.2.1-50	C, 202
Heat exchanger (tubes)	Heat transfer	Stainless steel	Lube oil (ext)	Fouling	Oil Analysis	V.D1.EP-79	3.2.1-51	A, 202
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Cracking	Oil Analysis	--	--	H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	V.D1.EP-80	3.2.1-50	C, 202
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	V.D1.E-21	3.2.1-27	A

Table 3.2.2-1: Safety Injection 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	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D1.EP-91	3.2.1-25	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water (int)	Fouling	Water Chemistry Control – Primary and Secondary	V.D1.E-20	3.2.1-19	A, 201
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 water (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-96	3.2.1-33	A
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
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

Table 3.2.2-1: Safety Injection System								
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	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
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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	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	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
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 – outdoor (ext)	Cracking	Buried and Underground Piping and Tanks Inspection	V.D1.EP-103	3.2.1-7	E

Table 3.2.2-1: Safety Injection 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 – outdoor (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	V.D1.EP-107	3.2.1-4	E
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	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
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

Table 3.2.2-1: Safety Injection 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	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 202
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
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	C

Table 3.2.2-1: Safety Injection System

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	Air – outdoor (ext)	Cracking	Aboveground Metallic Tanks	V.D1.EP-103	3.2.1-7	E
Tank	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-138	3.4.1-30	C
Tank	Pressure boundary	Stainless steel	Concrete (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-137	3.4.1-31	C
Tank	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-137	3.4.1-31	C
Tank	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
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Thermowell	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	V.D1.EP-103	3.2.1-7	A
Thermowell	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	V.D1.EP-107	3.2.1-4	A
Thermowell	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
Thermowell	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 3.2.2-1: Safety Injection System								
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	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	V.D1.E-13	3.2.1-1	A
Thermowell	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
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	V.D1.EP-103	3.2.1-7	A
Tubing	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	V.D1.EP-107	3.2.1-4	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F.EP-22	3.2.1-63	A

Table 3.2.2-1: Safety Injection 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 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	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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	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	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
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	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	V.D1.EP-103	3.2.1-7	A

Table 3.2.2-1: Safety Injection 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)	Loss of material	External Surfaces Monitoring	V.D1.EP-107	3.2.1-4	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
Vortex breaker	Flow control	Stainless steel	Treated borated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Vortex breaker	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
Containment Spray System
Summary of Aging Management Evaluation

Table 3.2.2-2: Containment Spray 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	V.E.EP-70	3.2.1-13	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Flow element	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	A, 201
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

Table 3.2.2-2: Containment Spray 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	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 (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.A.EP-41	3.2.1-22	C, 201
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	C
Heat exchanger (channel head)	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 (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	Lube oil (int)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 202

Table 3.2.2-2: Containment Spray 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	Raw water (int)	Loss of material	Service Water Integrity	V.A.EP-90	3.2.1-23	A
Heat exchanger (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	C
Heat exchanger (shell)	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	A
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel clad with stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.A.EP-91	3.2.1-25	A
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel clad with 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
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.A.EP-91	3.2.1-25	A
Heat exchanger (tube sheet)	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

Table 3.2.2-2: Containment Spray 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	Carbon steel	Lube oil (ext)	Fouling	Oil Analysis	V.A.EP-75	3.2.1-51	A, 202
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	V.A.EP-77	3.2.1-49	C, 202
Heat exchanger (tubes)	Heat transfer	Carbon steel	Treated water (int)	Fouling	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	V.A.EP-92	3.2.1-30	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (ext)	Fouling	Service Water Integrity	V.A.E-21	3.2.1-27	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	V.A.EP-91	3.2.1-25	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water (int)	Fouling	Water Chemistry Control – Primary and Secondary	V.A.EP-74	3.2.1-19	A, 201

Table 3.2.2-2: Containment Spray 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	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
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
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	Air – outdoor (ext)	Cracking	Buried and Underground Piping and Tanks Inspection	V.D1.EP-103	3.2.1-7	E

Table 3.2.2-2: Containment Spray 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 – outdoor (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	V.D1.EP-107	3.2.1-4	E
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Cracking	One-Time Inspection	--	--	H, 203
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
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
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	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	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 (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: Containment Spray 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 – 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
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

Table 3.2.2-3
Residual Heat Removal System
Summary of Aging Management Evaluation

Table 3.2.2-3: Residual Heat Removal 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	V.E.EP-70	3.2.1-13	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
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 > 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

Table 3.2.2-3: Residual Heat Removal 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	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	C
Heat exchanger (channel head)	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
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	C
Heat exchanger (channel head)	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
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-92	3.2.1-30	A

Table 3.2.2-3: Residual Heat Removal 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	Carbon steel clad with stainless steel	Treated borated water > 140°F (ext)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.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)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	C
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.D1.EP-41	3.2.1-22	C, 201
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.D1.EP-93	3.2.1-31	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water > 140°F (int)	Fouling	Water Chemistry Control – Primary and Secondary	V.D1.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.D1.E-12	3.2.1-20	C, 201
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	C

Table 3.2.2-3: Residual Heat Removal 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	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
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 140°F (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-96	3.2.1-33	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Cracking	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-98	3.2.1-28	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.D1.EP-93	3.2.1-31	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (ext)	Loss of material – wear	One-Time Inspection	--	--	H
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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201

Table 3.2.2-3: Residual Heat Removal 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	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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	V.D1.E-12	3.2.1-20	A, 201
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
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.D1.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	A
Thermowell	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: Residual Heat Removal 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 – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
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	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 3.2.2-4
Containment Penetrations
Summary of Aging Management Evaluation

Table 3.2.2-4: Containment Penetrations

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	V.E.EP-70	3.2.1-13	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	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	Gas (int)	None	None	V.F.EP-22	3.2.1-63	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.C.E-35	3.2.1-40	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	V.C.E-30	3.2.1-39	A

Table 3.2.2-4: Containment Penetrations

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	V.C.EP-99	3.2.1-29	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	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.C.EP-63	3.2.1-18	A, 201
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	A
Tubing	Pressure boundary	Copper alloy	Gas (int)	None	None	V.F.EP-9	3.2.1-57	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F.EP-22	3.2.1-63	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.C.E-35	3.2.1-40	A

Table 3.2.2-4: Containment Penetrations								
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 – 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	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	V.C.E-30	3.2.1-39	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.C.EP-99	3.2.1-29	A
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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
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 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	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	V.C.EP-63	3.2.1-18	A, 201

Table 3.2.2-5-1
Safety Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-5-1: Safety Injection 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	V.E.EP-70	3.2.1-13	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-5-1: Safety Injection 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	Gas (int)	None	None	V.F.EP-7	3.2.1-64	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
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 > 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)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202

Table 3.2.2-5-1: Safety Injection 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	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
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	C, 202
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	A
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
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.D1.E-12	3.2.1-20	A, 201
Thermowell	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 3.2.2-5-1: Safety Injection 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	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	V.F.EP-22	3.2.1-63	A
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)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.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
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	V.D1.E-28	3.2.1-9	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	Lube oil (int)	Loss of material	Oil Analysis	V.D1.EP-77	3.2.1-49	A, 202
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-5-1: Safety Injection 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	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)	Loss of material	Water Chemistry Control – Primary and Secondary	V.D1.EP-41	3.2.1-22	A, 201

Table 3.2.2-5-2
Containment Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-5-2: Containment Spray 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	V.E.EP-69	3.2.1-15	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	C
Flex connection	Pressure boundary	Elastomer	Waste water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Flex connection	Pressure boundary	Elastomer	Waste water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-5-2: Containment Spray 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
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	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

Table 3.2.2-5-3
Residual Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-5-3: Residual Heat 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	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	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 > 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
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
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-5-3: Residual Heat 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**
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
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	V.F.EP-18	3.2.1-63	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

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).

- Fuel Oil (Section 2.3.3.1)
- High Pressure Fire Protection – Water (Section 2.3.3.2)
- Fire Protection CO_2 and RCP Oil Collection (Section 2.3.3.3)
- Miscellaneous Heating, Ventilating and Air Conditioning (Section 2.3.3.4)
- Aux Building and Reactor Building Gas Treatment and Ventilation (Section 2.3.3.5)
- Control Building HVAC (Section 2.3.3.6)
- Compressed Air (Section 2.3.3.7)
- Station Drainage (Section 2.3.3.8)
- Sampling and Water Quality (Section 2.3.3.9)
- Chemical and Volume Control (Section 2.3.3.10)
- Essential Raw Cooling Water (Section 2.3.3.11)
- Component Cooling (Section 2.3.3.12)
- Waste Disposal (Section 2.3.3.13)
- Spent Fuel Pit Cooling (Section 2.3.3.14)
- Standby Diesel Generator (Section 2.3.3.15)
- Flood Mode Boration Makeup (Section 2.3.3.16)
- Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.3.17)

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 Fuel Oil System—Summary of Aging Management Evaluation
- Table 3.3.2-2 High Pressure Fire Protection – Water System—Summary of Aging Management Evaluation
- Table 3.3.2-3 Fire Protection CO_2 and RCP Oil Collection System—Summary of Aging Management Evaluation

- Table 3.3.2-17-13 Feedwater Secondary Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-14 Gland Seal Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-15 Station Drainage System and Sewage System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-16 Layup Water Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-17 Sampling and Water Quality System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-18 Turbogenerator Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-19 Hypochlorite System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-20 Injection Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-21 Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-22 Ice Condenser System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-17-23 Chemical and Volume Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-24 Emergency Gas Treatment System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-25 Essential Raw Cooling Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-26 Component Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-27 Waste Disposal System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-28 Spent Fuel Pit Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-29 Primary Water Makeup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-30 Standby Diesel Generator System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-31 Upper Head Injection System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-17-32 Radiation Monitoring 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 Fuel Oil

Materials

Fuel oil system components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Copper alloy >15% zinc or > 8% aluminum
- Gray cast iron
- Stainless steel

Environments

Fuel oil system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Fuel oil

Aging Effects Requiring Management

The following aging effects associated with the fuel oil system require management.

- Cracking
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the fuel oil system components.

- Bolting Integrity
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection

3.3.2.1.2 High Pressure Fire Protection – Water

Materials

High pressure fire protection – water system components are constructed of the following materials.

- Carbon steel
- Cast iron
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Gray cast iron
- Stainless steel

Environments

High pressure fire protection – water system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Exhaust gas
- Raw water
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the high pressure fire protection – water system require management.

- Cracking – fatigue
- Fouling
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for high pressure fire protection – water system components.

- Aboveground Metallic Tanks
- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection

- External Surfaces Monitoring
- Fire Water System
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.3 Fire Protection CO_2 and RCP Oil Collection

Materials

Fire protection CO_2 and RCP oil collection system components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Copper alloy >15% zinc or > 8% aluminum
- Stainless steel

Environments

Fire protection CO_2 and RCP oil collection system are exposed to the following environments.

- Air – indoor
- Concrete
- Gas
- Lube oil

Aging Effects Requiring Management

The following aging effects associated with the fire protection CO_2 and 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 CO_2 and RCP oil collection system components.

- Bolting Integrity
- Boric Acid Corrosion
- Buried and Underground Piping and Tanks Inspection

- External Surfaces Monitoring
- Fire Protection
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance

3.3.2.1.4 Miscellaneous Heating, Ventilating and Air Conditioning

Materials

Miscellaneous heating, ventilating and air conditioning system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Cast iron
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Elastomer
- Glass
- Stainless steel

Environments

Miscellaneous heating, ventilating and air conditioning system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Gas
- Lube oil
- Raw water
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the miscellaneous heating, ventilating and air conditioning systems require management.

- Change in material properties
- Cracking
- Fouling
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the miscellaneous heating, ventilating and air conditioning system components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.5 Aux Building and Reactor Building Gas Treatment and Ventilation

Materials

Aux building and reactor building gas treatment and ventilation system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Elastomer
- Stainless steel

Environments

Aux building and reactor building gas treatment and ventilation system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Gas
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the aux building and reactor building gas treatment and ventilation systems require management.

- Change in material properties
- Cracking
- Fouling
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the aux building and reactor building gas treatment and ventilation system components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.6 Control Building HVAC

Materials

Control building HVAC system components are constructed of the following materials.

- Carbon steel
- Cast iron
- Copper alloy

- Copper alloy > 15% zinc or > 8% aluminum
- Elastomer
- Fiberglass
- Glass
- Stainless steel

Environments

Control building HVAC system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Gas
- Lube oil
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the control building HVAC system require management.

- Change in material properties
- Cracking
- Fouling
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the control building HVAC system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Service Water Integrity

3.3.2.1.7 Compressed Air

Materials

Compressed air system components are constructed of the following materials.

- Carbon steel
- Copper alloy
- Nickel alloy
- Stainless steel

Environments

Compressed air system components are exposed to the following environments.

- Air – indoor
- Condensation
- Gas
- Raw water

Aging Effects Requiring Management

The following aging effects associated with the compressed air system require management.

- Cracking – fatigue
- Fouling
- Loss of material
- 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
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance
- Service Water Integrity

3.3.2.1.8 Station Drainage

Materials

Station drainage system components are constructed of the following materials.

- Carbon steel

Environments

Station drainage system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the station drainage system require management.

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the station drainage system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components

3.3.2.1.9 Sampling and Water Quality

Materials

Sampling and water quality system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Glass
- Stainless steel

Environments

Sampling and water quality system components are exposed to the following environments.

- Air – indoor
- Condensation
- Gas
- 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 sampling and water quality system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the sampling and water quality system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.3.2.1.10 Chemical and Volume Control

Materials

Chemical and volume control system components are constructed of the following materials.

- Carbon steel
- CASS
- Copper alloy

- Copper alloy >15% zinc or > 8% aluminum
- Stainless steel

Environments

Chemical and volume control system components are exposed to the following environments.

- Air – indoor
- Condensation
- Gas
- Lube oil
- Raw water
- 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 chemical and volume control system require management.

- Cracking
- Cracking – fatigue
- Fouling
- Loss of material
- Loss of preload
- Reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the chemical and volume control system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Inservice Inspection
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Thermal Aging Embrittlement of CASS

- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.3.2.1.11 Essential Raw Cooling Water

Materials

Essential raw cooling water system components are constructed of the following materials.

- Carbon steel
- Cast iron
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Nickel alloy
- Stainless steel

Environments

Essential raw cooling water system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Lube oil
- Raw water
- Soil

Aging Effects Requiring Management

The following aging effects associated with the essential raw cooling water system require management.

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the essential raw cooling water system components.

- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection
- External Surfaces Monitoring

- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity

3.3.2.1.12 Component Cooling

Materials

Component cooling system components are constructed of the following materials.

- Carbon steel
- Glass
- Stainless steel

Environments

Component cooling system components are exposed to the following environments.

- Air – indoor
- Condensation
- Raw water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the component cooling system require management.

- Cracking
- Fouling
- Loss of material
- Loss of preload

Aging Effects Requiring Management

The following aging effects associated with the component cooling system require management.

- Bolting Integrity
- External Surfaces Monitoring
- Periodic Surveillance and Preventive Maintenance
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.13 Waste Disposal

Materials

Waste disposal system components are constructed of the following materials.

- Carbon steel
- Cast iron
- Copper alloy > 15% zinc (inhibited)
- Copper alloy > 15% zinc or > 8% aluminum
- Elastomer
- Fiberglass
- Glass
- Stainless steel

Environments

Waste disposal system components are exposed to the following environments.

- Air – indoor
- Condensation
- Gas
- Treated water
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the waste disposal system require management.

- Change in material properties
- 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 waste disposal system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance

- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.14 Spent Fuel Pit Cooling

Materials

Spent fuel pit cooling system components are constructed of the following materials.

- Boral
- Carbon steel
- Stainless steel

Environments

Spent fuel pit cooling system components are exposed to the following environments.

- Air – indoor
- Treated borated water
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the spent fuel pit cooling system require management.

- Change in material properties
- Fouling
- Loss of material
- Loss of preload
- Reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the spent fuel pit cooling system components.

- Bolting Integrity
- Boric Acid Corrosion
- External Surfaces Monitoring
- Neutron-Absorbing Material Monitoring
- One-Time Inspection
- Water Chemistry Control – Closed Treated Water Systems
- Water Chemistry Control – Primary and Secondary

3.3.2.1.15 Standby Diesel Generator

Materials

Standby diesel generator system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Cast iron
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Glass
- Nickel alloy
- Stainless steel

Environments

Standby diesel generator system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Exhaust gas
- Lube oil
- Raw water
- Treated water
- Treated water > 140°F
- Waste water

Aging Effects Requiring Management

The following aging effects associated with the standby diesel generator system require management.

- Cracking
- Cracking – fatigue
- Fouling
- Loss of material
- Loss of material – wear
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the standby diesel generator system components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.16 Flood Mode Boration Makeup

Materials

Flood mode boration makeup system components are constructed of the following materials.

- Carbon steel
- Stainless steel

Environments

Flood mode boration makeup system components are exposed to the following environments.

- Air – indoor
- Condensation
- Treated borated water

Aging Effects Requiring Management

The following aging effects associated with the flood mode boration makeup system require management.

- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the flood mode boration makeup system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.3.2.1.17 Miscellaneous 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 3.3.2-17-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Aluminum
- Carbon steel
- Cast iron
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Elastomer
- Fiberglass
- Glass
- Nickel alloy
- Plastic
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Condensation
- Fuel oil
- Gas
- Lube oil
- Raw water

- Soil
- 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.

- Change in material properties
- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – wear
- 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
- Buried and Underground Piping and Tanks Inspection
- Compressed Air Monitoring
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Fire Water System
- Flow-Accelerated Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.2 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 SQN 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 designed to ASME Code or Crane Manufacturer's Association of America Specification #70 (CMAA-70) requirements, 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. The outside air at the SQN site is not conducive to cracking in stainless steel. The SQN site is not near a saltwater coastline, and nearby highways are treated only infrequently with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The SQN cooling tower water is not treated with chlorine or chlorine compounds. The SQN site is in an isolated location, away from agricultural or industrial sources of chloride contamination. Nevertheless, consistent with NUREG-1801, cracking of stainless steel components directly exposed to outdoor air is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program. At SQN, there are no stainless steel auxiliary systems components located indoors near unducted air intakes.

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 SQN charging pump casings have been replaced with 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. The outside air at the SQN site is not conducive to loss of material in stainless steel. The SQN site is not near a saltwater coastline, and nearby highways are treated only infrequently with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The SQN cooling tower water is not treated with chlorine or chlorine compounds. The SQN site is in an isolated location, away from agricultural or industrial sources of chloride contamination. Nevertheless, consistent with NUREG-1801, loss of material for stainless steel components directly exposed to outdoor air is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program. At SQN, there are no stainless steel auxiliary systems components located indoors near unducted air intakes.

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of SQN quality assurance procedures and administrative controls for aging management programs.

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 the 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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 [IN] 94-63, “Boric Acid Corrosion of Charging Pump Casings Caused by Cladding Cracks."	Yes, verify that plant- specific program addresses clad cracking	The SQN charging pump casings have been replaced with solid stainless steel casings. 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.

Table 3.3.1: Auxiliary Systems					
Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	SQN uses centrifugal charging pumps rather than positive displacement pumps. Cracking due to cyclic loading is not a significant aging effect for centrifugal pumps.
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.
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	There is no high-strength steel closure bolting used in auxiliary systems within the scope of license renewal.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-11	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	There is no high-strength steel closure bolting used in auxiliary systems within the scope of license renewal.
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 Number 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	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 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. Fouling of 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. Fouling, as used in the SQN aging management review, is equivalent to the NUREG-1801 aging effect of reduction of heat transfer.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 – Primary and Secondary Program to manage cracking. There are no stainless steel components exposed to treated water > 60°C (> 140°F) in the auxiliary systems within the scope of license renewal.
3.3.1-21	BWR only				
3.3.1-22	BWR only				

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. Loss of material for aluminum 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 – Primary and Secondary Program to manage cracking.
3.3.1-24	BWR only				
3.3.1-25	BWR only				
3.3.1-26	Steel (with elastomer lining), steel (with elastomer lining or stainless steel cladding) piping, piping components, and piping elements exposed to treated water	Loss of material due to pitting and crevice corrosion (only for steel after lining/ cladding degradation)	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	There are no steel piping components in the SQN spent fuel pit 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 – Primary and Secondary 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 – Primary and Secondary Program to manage cracking.
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	There are no concrete 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
3.3.1-30.5	Fiberglass, HDPE [high density polyethylene] 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.
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	There are no concrete components exposed to raw water in the auxiliary systems in the scope of license renewal.
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	There are no reinforced concrete or asbestos cement components exposed to raw water in the auxiliary systems in the scope of license renewal.
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	Cracking, change in material properties and loss of material for elastomer components exposed to raw water are managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components.

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	There are no concrete components exposed to raw water in the auxiliary systems in the scope of license renewal.
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	Consistent with NUREG-1801 for some components. Loss of material for nickel alloy components exposed to raw water is managed by the Service Water Integrity Program. The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material for other components. Copper alloy piping components exposed to raw water are addressed in Item 3.3.1-36.
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 components exposed to raw water in the standby diesel generator system with an intended function for license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Consistent with NUREG-1801 for some components. Loss of material for copper alloy components exposed to raw water is managed by the Service Water Integrity Program. The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material for other components.
3.3.1-37	Steel (with coating or lining) piping, piping components, and piping elements exposed to raw water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Loss of material for steel components exposed to raw water is managed by the Service Water Integrity Program. Coatings and linings are not credited for these components.
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 for most components. Loss of material for stainless steel components exposed to raw water is managed by the Service Water Integrity Program. For some components, the Internal Surfaces in Miscellaneous Piping and Ducting Components or Periodic Surveillance and Preventive Maintenance Program will manage loss of material using periodic visual inspections.
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	Consistent with NUREG-1801. Loss of material for stainless steel 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
3.3.1-42	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	Fouling of most copper alloy and stainless steel heat exchanger tubes is managed by the Service Water Integrity Program. The Fire Water System Program manages fouling for copper alloy heat exchanger tubes in the fire protection system. There are no titanium heat exchanger tubes exposed to raw water 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.
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.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Consistent with NUREG-1801. Loss of material for aluminum components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. Fouling of 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 SQN spent fuel storage racks.
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 Program. 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**
3.3.1-53	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	Consistent with NUREG-1801. Loss of material due to wear for steel crane rails exposed to indoor air is managed by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program. This item applies to aging management review results presented in Tables 3.5.2-X.
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.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 for most components. Loss of material for stainless steel components exposed to condensation is managed by the Compressed Air Monitoring Program. For some components, the Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material.
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. Cracking and change in material properties 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.

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 due to wear of steel fire doors is managed by the Fire Protection Program. This item applies to aging management review results presented in Tables 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 for concrete fire barriers. Cracking of concrete fire barriers exposed to indoor air is managed by the Fire Protection and Structures Monitoring Programs. Cracking of masonry wall fire barriers is managed by the Fire Protection and Masonry Wall 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 for concrete fire barriers. Cracking of concrete fire barriers exposed to outdoor air is managed by the Fire Protection and Structures Monitoring Programs. Cracking of masonry wall fire barriers is managed by the Fire Protection and Masonry Wall 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 for concrete fire barriers. Loss of material for concrete fire barriers exposed to indoor air is managed by the Fire Protection and Structures Monitoring Programs. Loss of material for masonry wall fire barriers is managed by the Fire Protection and Masonry Wall Programs. This item applies to aging management review results presented in Tables 3.5.2-X. Loss of material for barriers in outdoor air is addressed in Item 3.3.1-61.
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	Loss of material for steel fire hydrants exposed to outdoor air is managed by the External Surfaces Monitoring Program. These components (valves) are evaluated in Table 3.3.2-2 and addressed in Item 3.3.1-78.
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	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	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	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	Consistent with NUREG-1801. Loss of material for steel tanks exposed to outdoor air is managed by the Aboveground Metallic Tanks Program.
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	Steel components exposed to diesel fuel oil are addressed in Item 3.3.1-70.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 for most components. 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. The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material for the emergency fill line that is not normally used.
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.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	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 in the auxiliary systems in the scope of license renewal.
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 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
3.3.1-75	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 air – outdoor 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. Cracking and change in material properties of elastomer components exposed to indoor air are managed by the External Surfaces Monitoring Program.
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 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
3.3.1-78	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 steel spool pieces of the high pressure fire protection, essential raw cooling water and component cooling systems that are available (but not installed) to support flood mode operation. The Buried and Underground Piping and Tanks Inspection Program manages loss of material for steel components exposed to outdoor air but located in a pipe tunnel.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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]				
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	Consistent with NUREG-1801. Cracking and change in material properties of elastomer components exposed to closed-cycle cooling water are managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
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	Consistent with NUREG-1801. Cracking and change in material properties of elastomer components exposed to treated water are managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. There are no elastomer components exposed to raw water or treated borated 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
3.3.1-87	[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 raw water (potable) or diesel exhaust is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
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	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	No	Consistent with NUREG-1801 for most steel and copper alloy components exposed to 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 some copper alloy components of the HVAC systems.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Consistent with NUREG-1801. Loss of material for steel ducting and components exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
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 some 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 other steel components.
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	There is no stainless steel ducting exposed to internal condensation in the auxiliary systems in scope for license renewal.

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, stainless steel and 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 other copper alloy, stainless steel and steel components. Loss of material for nickel alloy components of the compressed air and diesel generator (compressed air) systems is managed by the Compressed Air Monitoring Program.
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. Wear of internal surfaces of elastomer components exposed to indoor air 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
3.3.1-97	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 Internal Surfaces in Miscellaneous Piping and Ducting Components and Periodic Surveillance and Preventive Maintenance Programs use periodic visual inspections to manage loss of material for some steel components exposed to lube oil.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 strainers in the RCP oil collection subsystem of the fire protection equipment, the External Surfaces Monitoring Program manages 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	There are no buried concrete components in the auxiliary systems in the scope of license renewal.
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	There are no concrete or asbestos cement components exposed to soil or concrete in the systems in the scope of license renewal.
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. NUREG-1801 does not include concrete as an environment for this item.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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	Consistent with NUREG-1801 for steel components. Loss of material for these components is managed by the Buried and Underground Piping and Tanks Inspection Program. There are no underground aluminum, copper alloy, stainless steel or nickel alloy components 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
3.3.1-110	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.
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 aluminum components exposed to uncontrolled indoor air and gas. There are no aluminum components exposed to other environments represented by this item, 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
3.3.1-114	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 copper alloy components exposed to uncontrolled indoor air and gas. There are no copper alloy components exposed to other environments represented by this item, in systems in the scope of license renewal.
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	Consistent with NUREG-1801 for copper alloy (≤ 15% Zn and ≤ 8% Al) components exposed to indoor air (which includes the potential for borated water leakage where applicable) as addressed in Item 3.3.1-114.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-117	Glass piping elements exposed to air – indoor, uncontrolled (external), lubricating oil, closed-cycle cooling water, air – outdoor, fuel oil, raw water, treated water, treated borated water, air with borated water leakage, condensation (internal/external) gas	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for glass components exposed to indoor air, condensation, gas, closed-cycle cooling water, lube oil, treated borated water and treated water. There are no glass auxiliary system components exposed to other environments represented by this item in the scope of license renewal.
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	Consistent with NUREG-1801.

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 [polyvinyl chloride], 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 encompassed 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 stainless steel components exposed to indoor air (which includes the potential for borated water leakage where applicable) or gas. There are no stainless steel auxiliary system components exposed to other environments represented by this item, 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**
3.3.1-121	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 steel components exposed to gas. There are no steel auxiliary system components exposed to other environments represented by this item, in the scope of license renewal.
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 Control – Primary and Secondary 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 Control – Primary and Secondary Program.

Notes for Tables 3.3.2-1 through 3.3.2-17-32

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 the 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. These small 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.

305. For the purposes of evaluating selective leaching, this environment can be considered equivalent to the NUREG-1801 environment.

306. The normal environment temperature for this component is less than the 95°F threshold for hardening and loss of strength.

307. This fiberglass piping is installed in the drain line for the ice condenser and is wetted only intermittently.

308. 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.

309. This component is an emergency fill line that is only rarely exposed to fuel oil so the Diesel Fuel Monitoring Program is not directly applicable. It is normally exposed to air and fuel oil vapors.

310. For the purposes of evaluating aging of these elastomer components, this PWR secondary treated water environment is considered equivalent to the NUREG-1801 environment.

311. This treated water is equivalent to the NUREG-1801 raw water (potable) environment.

Table 3.3.2-1
Fuel Oil System
Summary of Aging Management Evaluation

Table 3.3.2-1: Fuel Oil 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Flame arrestor	Flow control	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.H1.AP-209	3.3.1-4	A
Flame arrestor	Flow control	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.AP-221	3.3.1-6	A

Table 3.3.2-1: Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flame arrestor	Flow control	Stainless steel	Air – outdoor (int)	Cracking	External Surfaces Monitoring	VII.H1.AP-209	3.3.1-4	A, 304
Flame arrestor	Flow control	Stainless steel	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	VII.H1.AP-221	3.3.1-6	A, 304
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex connection	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
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.H1.A-24	3.3.1-80	A
Piping	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	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
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303

Table 3.3.2-1: Fuel Oil System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	A
Piping	Pressure boundary	Gray cast iron	Fuel oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H1.AP-105	3.3.1-70	E, 309
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
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	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	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
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	VII.J.AP-282	3.3.1-112	C

Table 3.3.2-1: Fuel Oil 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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	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	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	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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303

Table 3.3.2-2
High Pressure Fire Protection – Water System
Summary of Aging Management Evaluation

Table 3.3.2-2: High Pressure 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
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	A
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	A

Table 3.3.2-2: High Pressure Fire Protection – Water 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	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flow element	Pressure boundary Flow control	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Heat exchanger (channel head)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (channel head)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	C
Heat exchanger (shell)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (shell)	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

Table 3.3.2-2: High Pressure 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)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Fire Water System	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	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	C
Heater housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Heater housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Muffler	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Muffler	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

Table 3.3.2-2: High Pressure Fire Protection – Water 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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Nozzle	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A
Nozzle	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	A
Nozzle	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	A
Nozzle	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
Orifice	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-2: High Pressure Fire Protection – Water 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	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Orifice	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
Orifice	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	A
Orifice	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
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 (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.I.A-77	3.3.1-78	E

Table 3.3.2-2: High Pressure 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 – 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 (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.A.E-29	3.2.1-44	E
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.I.A-78	3.3.1-78	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.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

Table 3.3.2-2: High Pressure 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	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
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
Pump casing	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Pump casing	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Retard chamber	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Retard chamber	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Strainer	Filtration	Stainless steel	Raw water (ext)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	A
Strainer	Filtration	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	A

Table 3.3.2-2: High Pressure 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	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	A
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Aboveground Metallic Tanks	VII.H1.A-95	3.3.1-67	C
Tank	Pressure boundary	Carbon steel	Concrete (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-115	3.4.1-30	C
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Fire Water System	--	--	G
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	C
Tank	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-115	3.4.1-30	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	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

Table 3.3.2-2: High Pressure 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	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	Carbon steel	Air – outdoor (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.I.A-78	3.3.1-78	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	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
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	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Cast iron	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	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	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	A

Table 3.3.2-2: High Pressure 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	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
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	A
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	A
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
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	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A

Table 3.3.2-2: High Pressure 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	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-51	3.3.1-72	A
Vortex breaker	Flow control	Carbon steel	Raw water (ext)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Vortex breaker	Flow control	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A

Table 3.3.2-3
Fire Protection CO_2 and RCP Oil Collection System
Summary of Aging Management Evaluation

Table 3.3.2-3: Fire Protection CO_2 and 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	C
Nozzle	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	A

Table 3.3.2-3: Fire Protection CO_2 and RCP Oil Collection 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	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
Odorizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	A
Odorizer	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	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VII.I.AP-284	3.3.1-109.5	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	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	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	A

Table 3.3.2-3: Fire Protection CO_2 and 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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
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
Strainer	Filtration	Stainless steel	Lube oil (ext)	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	Fire Protection	VII.G.AP-150	3.3.1-58	C
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Tubing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	A
Tubing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	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	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	A

Table 3.3.2-3: Fire Protection CO_2 and RCP Oil Collection 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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	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
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A

Table 3.3.2-4
Miscellaneous Heating, Ventilating and Air Conditioning Systems
Summary of Aging Management Evaluation

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
AHU housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
AHU 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
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Condenser housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Condenser 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
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.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	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	C
Damper housing	Pressure boundary	Aluminum	Air – indoor (int)	None	None	VII.J.AP-135	3.3.1-113	C
Damper housing	Pressure boundary	Aluminum	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	--	--	H
Damper housing	Pressure boundary	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	C
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	C

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Duct	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
Duct	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Duct	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
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F2.AP-113	3.3.1-82	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct flexible 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
Fan housing	Pressure boundary	Aluminum	Air – indoor (int)	None	None	VII.J.AP-135	3.3.1-113	C
Fan housing	Pressure boundary	Aluminum	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	--	--	H
Fan housing	Pressure boundary	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	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 (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.A.E-29	3.2.1-44	E, 308
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
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

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems								
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 – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Filter	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Filter	Filtration	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.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	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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Flex connection	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex connection	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Flex connection	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
Flow element	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems								
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	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
Heat exchanger (channel head)	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A
Heat exchanger (channel head)	Pressure boundary	Cast iron	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (fins)	Heat transfer	Aluminum	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (fins)	Heat transfer	Aluminum	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance	--	--	H
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302
Heat exchanger (shell)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-189	3.3.1-46	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

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	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F2.A-08	3.3.1-90	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Gas (ext)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	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	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-189	3.3.1-46	A
Heat exchanger (tubes)	Heat transfer	Copper alloy	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

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	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance	--	--	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, 308
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.G.AP-143	3.3.1-89	E, 308
Heat exchanger (tubes)	Heat transfer	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	C

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Lube oil (ext)	Fouling	Oil Analysis	V.A.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (ext)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-205	3.3.1-50	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems								
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.F2.AP-199	3.3.1-46	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Fouling	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.F2.AP-199	3.3.1-46	C
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	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
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F2.AP-127	3.3.1-97	A, 302
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Orifice	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.F2.A-10	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	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	Lube oil (int)	Loss of material	Oil Analysis	VII.F2.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
Separator housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Separator housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Separator housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Separator housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F2.AP-127	3.3.1-97	A, 302
Separator housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F2.AP-127	3.3.1-97	A, 302
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-109	3.3.1-79	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.F2.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.F2.AP-199	3.3.1-46	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	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Gas (int)	None	None	VII.J.AP-98	3.3.1-117	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Lube oil (int)	None	None	VII.J.AP-15	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-81	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.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
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 302
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	C
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	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
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.C1.AP-133	3.3.1-99	C, 302
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
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 302
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)	Cracking	Periodic Surveillance and Preventive Maintenance	--	--	H
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.F2.A-10	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.F2.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	C

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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 – Closed Treated Water Systems	VII.F2.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	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.F2.AP-109	3.3.1-79	A
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	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.C1.AP-133	3.3.1-99	C, 302

Table 3.3.2-4: Miscellaneous Heating, Ventilating and Air Conditioning 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	Treated water (int)	Loss of material	Selective Leaching	VII.F2.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.F2.AP-199	3.3.1-46	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C

Table 3.3.2-5
Aux Building and Reactor Building Gas Treatment/Ventilation System
Summary of Aging Management Evaluation

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Coil	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-109	3.3.1-79	A
Coil	Pressure boundary	Copper alloy	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	A
Coil	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
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	C
Damper housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Duct	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
Duct	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Duct	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	C
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F2.AP-113	3.3.1-82	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	A

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct flexible 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
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.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-17	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
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	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-109	3.3.1-79	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	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

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	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
Package unit	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Package unit	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
Regulator	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Regulator	Pressure boundary	Aluminum	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.F2.AP-142	3.3.1-92	E
Screen	Filtration	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Separator	Pressure boundary Filtration	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Separator	Pressure boundary Filtration	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F2.A-08	3.3.1-90	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	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	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	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	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

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation 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	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
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	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.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
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-5: Aux Building and Reactor Building Gas Treatment/Ventilation 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 (int)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C

Table 3.3.2-6
Control Building HVAC System
Summary of Aging Management Evaluation

Table 3.3.2-6: Control Building HVAC System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
AHU housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
AHU 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
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Coil	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-6: Control Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Coil	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Compressor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Compressor housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Duct	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
Duct	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A

Table 3.3.2-6: Control Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Duct	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
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	A
Duct flexible 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
Duct flexible connection	Pressure boundary	Fiberglass	Air – indoor (ext)	None	None	--	--	G
Duct flexible connection	Pressure boundary	Fiberglass	Air – indoor (int)	None	None	--	--	G

Table 3.3.2-6: Control Building 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 (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
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
Fan housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Fan housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	C
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	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	C

Table 3.3.2-6: Control Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flex connection	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Flex connection	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Heat exchanger (channel head)	Pressure boundary	Cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heat exchanger (channel head)	Pressure boundary	Cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	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	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302

Table 3.3.2-6: Control Building HVAC 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	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	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	Lube oil (ext)	Fouling	Oil Analysis	V.A.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C

Table 3.3.2-6: Control Building 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F1.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	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	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Separator housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Separator housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Separator housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F1.AP-127	3.3.1-97	A, 302
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-6: Control Building HVAC System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	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	Glass	Gas (int)	None	None	VII.J.AP-98	3.3.1-117	A
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Thermowell	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F1.AP-127	3.3.1-97	A, 302
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-6: Control Building HVAC 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	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.C1.AP-133	3.3.1-99	C, 302
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	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.F1.A-10	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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	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

Table 3.3.2-6: Control Building HVAC 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	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.C1.AP-133	3.3.1-99	C, 302
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

Table 3.3.2-7
Compressed Air Systems
Summary of Aging Management Evaluation

Table 3.3.2-7: Compressed Air 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	VII.I.A-77	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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Compressor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Compressor housing	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A

Table 3.3.2-7: Compressed Air Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Dryer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Dryer	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	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
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 connection	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Flex connection	Pressure boundary	Nickel alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.E5.AP-274	3.3.1-95	E
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

Table 3.3.2-7: Compressed Air Systems								
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	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
Heat exchanger (fins)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Periodic Surveillance and Preventive Maintenance	--	--	H
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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	C

Table 3.3.2-7: Compressed Air 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	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Orifice	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Orifice	Pressure boundary Flow control	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	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 (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
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

Table 3.3.2-7: Compressed Air 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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	C
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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.A-23	3.3.1-89	C

Table 3.3.2-7: Compressed Air 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.I.A-77	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	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	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C

Table 3.3.2-8
Station Drainage System
Summary of Aging Management Evaluation

Table 3.3.2-8: Station Drainage 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-8: Station Drainage 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	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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Pump casing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	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
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
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 3.3.2-9
Sampling and Water Quality System
Summary of Aging Management Evaluation

Table 3.3.2-9: Sampling and Water Quality 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Fan housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Fan 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	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
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 3.3.2-9: Sampling and Water Quality 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	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
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (tubes)	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	C, 301
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
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

Table 3.3.2-9: Sampling and Water Quality 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	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	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	Gas (int)	None	None	VII.J.AP-22	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	C, 301
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 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	C
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301

Table 3.3.2-9: Sampling and Water Quality 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	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
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
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
Regulator	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Regulator	Pressure boundary	Aluminum	Gas (int)	None	None	VII.J.AP-37	3.3.1-113	A
Separator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Separator	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-48	3.3.1-117	A

Table 3.3.2-9: Sampling and Water Quality System								
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 (int)	None	None	VII.J.AP-48	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Gas (int)	None	None	VII.J.AP-98	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
Sight glass	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Trap	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Trap	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
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 3.3.2-9: Sampling and Water Quality 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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	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	C, 301
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
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

Table 3.3.2-9: Sampling and Water Quality 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)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
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.A3.AP-79	3.3.1-125	C, 301
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301

Table 3.3.2-9: Sampling and Water Quality 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	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.A3.AP-79	3.3.1-125	C, 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
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)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-10
Chemical and Volume Control System
Summary of Aging Management Evaluation

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Blender	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Blender	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cooler housing	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
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	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	3.3.1-29	A
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	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A
Filter housing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flow element	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Flow element	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Flow element	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A
Flow element	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Heat exchanger (channel head)	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
Heat exchanger (channel head)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-66	3.3.1-72	C
Heat exchanger (channel head)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	C
Heat exchanger (channel head)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Inservice Inspection	VII.E1.AP-119	3.3.1-8	A
Heat exchanger (channel head)	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
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

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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.AP-79	3.3.1-29	C
Heat exchanger (shell)	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)	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302
Heat exchanger (shell)	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)	Pressure boundary	CASS	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Cracking	Inservice Inspection	VII.E1.AP-119	3.3.1-8	A
Heat exchanger (shell)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118	3.3.1-20	A, 301
Heat exchanger (shell)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-100	3.3.1-2	A
Heat exchanger (shell)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	C
Heat exchanger (shell)	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Thermal Aging Embrittlement of CASS	V.D1.E-47	3.2.1-10	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)	Cracking	Oil Analysis	--	--	H
Heat exchanger (shell)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 302

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tube sheet)	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Copper alloy	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 302
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	C
Heat exchanger (tube sheet)	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)	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.AP-79	3.3.1-29	C

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tube sheet)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118 VII.E1.A-69	3.3.1-20 3.3.1-3	A, 301
Heat exchanger (tube sheet)	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)	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	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	Copper alloy	Lube oil (ext)	Fouling	Oil Analysis	V.A.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Lube oil (ext)	Fouling	Oil Analysis	V.D1.EP-79	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Cracking	Oil Analysis	--	--	H
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 302
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	VII.C1.AP-187	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water > 140°F (ext)	Fouling	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 (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118	3.3.1-20	A, 301

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	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)	Pressure boundary	Stainless steel	Treated borated water > 140°F (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated borated water > 140°F (int)	Fouling	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	Water Chemistry Control – Primary and Secondary	VII.E1.AP-118 VII.E1.A-69	3.3.1-20 3.3.1-3	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.AP-79	3.3.1-29	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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
Nozzle	Flow control	Stainless steel	Gas (ext)	None	None	VII.J.AP-22	3.3.1-120	A
Nozzle	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	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	Treated borated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D1.E-24	3.2.1-5	E
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	A
Orifice	Pressure boundary Flow control	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.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	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-127	3.3.1-97	A, 302
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	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Piping	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A
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.AP-79	3.3.1-29	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	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	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-127	3.3.1-97	A, 302
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	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	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	3.3.1-29	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	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A
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.AP-79	3.3.1-29	A

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	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	3.3.1-29	A
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Valve body	Pressure boundary	CASS	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-10: Chemical and Volume Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	CASS	Treated borated water > 482°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A
Valve body	Pressure boundary	CASS	Treated borated water > 482°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	A
Valve body	Pressure boundary	CASS	Treated borated water > 482°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.AP-79	3.3.1-29	A
Valve body	Pressure boundary	CASS	Treated borated water > 482°F (int)	Reduction of fracture toughness	Inservice Inspection	IV.C2.R-08	3.1.1-38	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	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.AP-79	3.3.1-29	A
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.E1.AP-82	3.3.1-28	A

Table 3.3.2-10: Chemical and Volume Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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.AP-79	3.3.1-29	A

Table 3.3.2-11
Essential Raw Cooling Water Systems
Summary of Aging Management Evaluation

Table 3.3.2-11: Essential Raw Cooling Water 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Carbon steel	Raw water (ext)	Loss of preload	Bolting Integrity	VII.I.AP-264	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A

Table 3.3.2-11: Essential Raw Cooling Water Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Coil	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
Coil	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	A
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flex connection	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Flow element	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flow element	Pressure boundary Flow control	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Flow element	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-11: Essential Raw Cooling Water 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 Flow control	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Nozzle	Pressure boundary Flow control	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
Nozzle	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	A
Nozzle	Pressure boundary Flow control	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-196	3.3.1-36	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 (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.I.A-77	3.3.1-78	E

Table 3.3.2-11: Essential Raw Cooling Water 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	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	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 (ext)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	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
Piping	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Piping	Pressure boundary	Nickel alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-206	3.3.1-34	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-11: Essential Raw Cooling Water 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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	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	Cast iron	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Pump casing	Pressure boundary	Cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Strainer	Filtration	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Strainer	Filtration	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-11: Essential Raw Cooling Water 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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	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	Raw water (ext)	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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Valve body	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
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 3.3.2-12
Component Cooling System
Summary of Aging Management Evaluation

Table 3.3.2-12: Component Cooling 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Condenser housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Condenser 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	C
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flex connection	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
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-12: Component Cooling 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	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 (end cover)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (end cover)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
Heat exchanger (end cover)	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 (plates)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Heat exchanger (plates)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	VII.C1.AP-187	3.3.1-42	C
Heat exchanger (plates)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	C

Table 3.3.2-12: Component Cooling System								
Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (plates)	Heat transfer	Stainless steel	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	A
Heat exchanger (plates)	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	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 (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.I.A-77	3.3.1-78	E
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	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)	Cracking	Periodic Surveillance and Preventive Maintenance	--	--	H

Table 3.3.2-12: Component Cooling 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Plate	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.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	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	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-48	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 3.3.2-12: Component Cooling 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	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	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	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
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	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	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
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

Table 3.3.2-12: Component Cooling 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	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
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-13
Waste Disposal Systems
Summary of Aging Management Evaluation

Table 3.3.2-13: Waste Disposal 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Compressor housing	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Compressor housing	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Compressor housing	Pressure boundary	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
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C

Table 3.3.2-13: Waste Disposal Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	C
Expansion joint	Pressure boundary	Elastomer	Waste water (int)	None	None	--	--	G, 306
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	C
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
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

Table 3.3.2-13: Waste Disposal Systems

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	Copper alloy > 15% Zn or > 8% Al	Treated water (ext)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	C
Heat exchanger (tube sheet)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	C
Heat exchanger (tube sheet)	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
Heat exchanger (tube sheet)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	--	--	G
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	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)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Waste water (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-272	3.3.1-95	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-13: Waste Disposal Systems								
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	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	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	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	A
Piping	Pressure boundary	Fiberglass	Air – indoor (ext)	None	None	--	--	G

Table 3.3.2-13: Waste Disposal Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Fiberglass	Waste water (int)	None	None	--	--	G, 307
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	A
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Waste water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
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

Table 3.3.2-13: Waste Disposal Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Screen	Filtration	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Screen	Filtration	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	A
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	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
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

Table 3.3.2-13: Waste Disposal Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	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	Cast iron	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Strainer housing	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	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
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	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 (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	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	A

Table 3.3.2-13: Waste Disposal Systems								
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	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	A
Tubing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	A
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	Boric Acid Corrosion	VII.I.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

Table 3.3.2-13: Waste Disposal 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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	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	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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	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	A

Table 3.3.2-13: Waste Disposal Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Vortex breaker	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	A, 308
Vortex breaker	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	A

Table 3.3.2-14
Spent Fuel Pit Cooling System
Summary of Aging Management Evaluation

Table 3.3.2-14: Spent Fuel Pit Cooling 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	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
Bolting	Pressure boundary	Stainless steel	Treated borated water (ext)	Loss of preload	Bolting Integrity	VII.I.AP-265	3.3.1-15	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 borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301

Table 3.3.2-14: Spent Fuel Pit Cooling 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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary Flow control	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
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

Table 3.3.2-14: Spent Fuel Pit Cooling 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.A3.AP-189	3.3.1-46	A
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)	Fouling	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)	Fouling	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

Table 3.3.2-14: Spent Fuel Pit Cooling 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)	Change in material properties	Neutron-Absorbing Material Monitoring	VII.A2.AP-235	3.3.1-102	A
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
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	Air – indoor (int)	None	None	VII.J.AP-123	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.A3.AP-79	3.3.1-125	A, 301

Table 3.3.2-14: Spent Fuel Pit Cooling 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	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 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
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	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	A, 301
Strainer	Filtration	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
Strainer	Filtration	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
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-14: Spent Fuel Pit Cooling System								
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	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-123	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-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	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
Standby Diesel Generator System
Summary of Aging Management Evaluation

Table 3.3.2-15: Standby Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Air start motor housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Air start motor housing	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking	Periodic Surveillance and Preventive Maintenance	VII.H2.AP-128	3.3.1-83	E

Table 3.3.2-15: Standby 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	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex connection	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.H2.AP-41	3.3.1-80	A
Heat exchanger (channel head)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C

Table 3.3.2-15: Standby 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	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 (fins)	Heat transfer	Aluminum	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
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	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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	A, 302
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
Heat exchanger (tube sheet)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	A, 302

Table 3.3.2-15: Standby 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 (tube sheet)	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
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	C
Heat exchanger (tube sheet)	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	Carbon steel	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C, 308
Heat exchanger (tubes)	Heat transfer	Carbon steel	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.F1.AP-204	3.3.1-50	C

Table 3.3.2-15: Standby 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)	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 > 15% Zn or > 8% Al	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn or > 8% Al	Lube oil (ext)	Fouling	Oil Analysis	V.A.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-133	3.3.1-99	C, 302
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (ext)	Loss of material – wear	Periodic Surveillance and Preventive Maintenance	--	--	H
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	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

Table 3.3.2-15: Standby 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)	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	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (int)	Fouling	Service Water Integrity	VII.H2.AP-187	3.3.1-42	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.H2.AP-55	3.3.1-41	C
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 140°F (ext)	Fouling	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 > 140°F (ext)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.E3.AP-192	3.3.1-44	C
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140°F (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 > 140°F (ext)	Loss of material – wear	Service Water Integrity	--	--	H

Table 3.3.2-15: Standby 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heater housing	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
Lubricator housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Lubricator housing	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	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	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

Table 3.3.2-15: Standby 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	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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
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
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
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	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
Sight glass	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: Standby Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	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
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.H2.AP-199	3.3.1-46	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	Lube oil (int)	None	None	VII.J.AP-15	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-166	3.3.1-117	A
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	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A

Table 3.3.2-15: Standby Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer	Filtration	Nickel alloy	Condensation (ext)	Loss of material	Compressed Air Monitoring	--	--	F
Strainer	Filtration	Nickel alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.E5.AP-274	3.3.1-95	E
Strainer	Filtration	Stainless steel	Lube oil (ext)	Cracking	Oil Analysis	--	--	H
Strainer	Filtration	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Strainer	Filtration	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Strainer	Filtration	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Strainer housing	Pressure boundary	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Cast iron	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
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 (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C

Table 3.3.2-15: Standby 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	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	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
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	C
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

Table 3.3.2-15: Standby 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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
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 > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
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
Turbocharger	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Turbocharger	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
Turbocharger	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
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A

Table 3.3.2-15: Standby 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	Aluminum	Condensation (int)	Cracking	Periodic Surveillance and Preventive Maintenance	--	--	H
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.I.A-77	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	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
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	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: Standby 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	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 (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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.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.H2.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.H2.AP-199	3.3.1-46	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302

Table 3.3.2-16
Flood Mode Boration Makeup System
Summary of Aging Management Evaluation

Table 3.3.2-16: Flood Mode Boration Makeup 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Demineralizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Demineralizer	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Filter	Filtration	Stainless steel	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D1.EP-81	3.2.1-48	C, 308
Filter	Filtration	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C

Table 3.3.2-16: Flood Mode Boration Makeup 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	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	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	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
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	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C

Table 3.3.2-16: Flood Mode Boration Makeup 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	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D1.EP-81	3.2.1-48	C, 308
Strainer	Filtration	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	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

Table 3.3.2-16: Flood Mode Boration Makeup 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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
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	C, 301

**Table 3.3.2-17-1
Auxiliary Boiler System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-17-1: Auxiliary Boiler 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Deaerator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Deaerator	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Deaerator	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 301
Deaerator	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-1: Auxiliary Boiler 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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.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.B1.SP-155	3.4.1-16	C, 301
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-1: Auxiliary Boiler 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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 301
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	C, 301
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)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.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 3.3.2-17-1: Auxiliary Boiler 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	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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, 301
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-1: Auxiliary Boiler 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Pump casing	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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-32	3.3.1-72	C
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 301
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A

Table 3.3.2-17-1: Auxiliary Boiler 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	Treated water (int)	None	None	VII.J.AP-51	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Strainer housing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 301
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Strainer housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C

Table 3.3.2-17-1: Auxiliary Boiler 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	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 301
Tank	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 301
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	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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C

Table 3.3.2-17-1: Auxiliary Boiler 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)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 301
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
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 water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301
Tubing	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-1: Auxiliary Boiler 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	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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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, 301
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
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	C, 301
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	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-1: Auxiliary Boiler 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	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.B1.SP-155	3.4.1-16	C, 301
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)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-17-2
Fuel Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-2: Fuel Oil 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	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	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	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
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

Table 3.3.2-17-2: Fuel Oil 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 – 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 3.3.2-17-3
Central Lubricating Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-3: Central Lubricating Oil 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.I.A-77	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-127	3.3.1-97	E
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Cooler (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302
Filter housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A

Table 3.3.2-17-3: Central Lubricating Oil 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**
Filter housing	Pressure boundary	Aluminum	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Filter housing	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	C, 302
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heater housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 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
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 3.3.2-17-3: Central Lubricating Oil 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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Separator	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
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 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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-3: Central Lubricating Oil 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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	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	C, 302
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.C1.AP-127	3.3.1-97	C, 302

Table 3.3.2-17-4
Raw Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-4: Raw 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	C
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Cooler housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Cooler housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Flex connection	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C

Table 3.3.2-17-4: Raw 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**
Flex connection	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-196	3.3.1-36	E
Flex connection	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flex connection	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
Flow element	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flow element	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
Orifice	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
Orifice	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.AP-196	3.3.1-36	E

Table 3.3.2-17-4: Raw 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
Orifice	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	A
Orifice	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Orifice	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	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

Table 3.3.2-17-4: Raw 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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-196	3.3.1-36	E
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Rupture disc	Pressure boundary	Nickel alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.3.2-17-4: Raw 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
Rupture disc	Pressure boundary	Nickel alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-206	3.3.1-34	E
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VII.J.AP-50	3.3.1-117	A
Sight glass	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Sight glass	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Strainer housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	A, 302

Table 3.3.2-17-4: Raw 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
Thermowell	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Thermowell	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	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	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-196	3.3.1-36	E
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.3.2-17-4: Raw 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
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
Tubing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.C1.A-54	3.3.1-40	E
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
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

Table 3.3.2-17-4: Raw 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	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.AP-196	3.3.1-36	E
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	A
Valve body	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E

Table 3.3.2-17-5
Raw Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	C
Flex connection	Pressure boundary	Elastomer	Raw water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-75	3.3.1-32.5	E

Table 3.3.2-17-5: Raw Service 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**
Flex connection	Pressure boundary	Elastomer	Raw water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-75	3.3.1-32.5	E
Flex connection	Pressure boundary	Elastomer	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-76	3.3.1-32.5	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	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
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C

Table 3.3.2-17-5: Raw Service 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	VIII.G.SP-136	3.4.1-38	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	C
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-196	3.3.1-36	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
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 3.3.2-17-5: Raw Service 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	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	Fire Water System	VII.G.AP-197	3.3.1-64	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.AP-196	3.3.1-36	E
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	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.C1.A-47	3.3.1-72	A, 305

Table 3.3.2-17-6
High Pressure Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-6: High Pressure Fire Protection 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Orifice	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	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	Fire Water System	VII.G.A-33	3.3.1-64	A

Table 3.3.2-17-6: High Pressure Fire Protection 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
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	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	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	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	Raw water (int)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C

Table 3.3.2-17-6: High Pressure Fire Protection 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	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	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	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	A
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
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.C1.A-47	3.3.1-72	C, 305

Table 3.3.2-17-6: High Pressure Fire Protection 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-17	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-55	3.3.1-66	A

Table 3.3.2-17-7
Water Treatment System and Makeup Water Treatment Plant
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Ejector	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Ejector	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.AP-196	3.3.1-36	E
Ejector	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
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.A-54	3.3.1-40	E
Flow element	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
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
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Orifice	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 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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	Plastic	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	--	--	F
Piping	Pressure boundary	Plastic	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Piping	Pressure boundary	Plastic	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Pump casing	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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	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-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-51	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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 water (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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Thermowell	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 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 301
Tubing	Pressure boundary	Plastic	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	--	--	F
Tubing	Pressure boundary	Plastic	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Tubing	Pressure boundary	Plastic	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
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	C, 301
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 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-196	3.3.1-36	E
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	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-32	3.3.1-72	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 301
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-272	3.3.1-95	E
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
Valve body	Pressure boundary	Plastic	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	--	--	F

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Plastic	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Valve body	Pressure boundary	Plastic	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Valve body	Pressure boundary	Plastic	Waste water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Valve body	Pressure boundary	Plastic	Waste water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-7: Water Treatment System and Makeup Water Treatment Plant, 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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-17-8
Potable (Treated) Water Distribution System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-8: Potable (Treated) Water Distribution 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	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	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 311
Piping	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Piping	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-271	3.3.1-93	C, 311

Table 3.3.2-17-8: Potable (Treated) Water Distribution 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	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 311
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 311
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-271	3.3.1-93	C, 311
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 311

Table 3.3.2-17-8: Potable (Treated) Water Distribution 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	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	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-271	3.3.1-93	C, 311
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-32	3.3.1-72	C, 305

**Table 3.3.2-17-9
Heating Ventilating and Air Conditioning Systems
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Coil	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	C
Coil	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-254	3.3.1-48	C
Coil	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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
Coil	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-205	3.3.1-50	A
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	C
Damper 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
Damper housing	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Duct	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 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.A.E-29	3.2.1-44	E
Duct	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 – 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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
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
Fan 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	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	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.F2.AP-202	3.3.1-45	A

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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**
Flex connection	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Flex connection	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	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	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C2.AP-259	3.3.1-85	C
Flex connection	Pressure boundary	Elastomer	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C2.AP-259	3.3.1-85	C
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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**
Flex connection	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
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
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 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	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.F2.A-10	3.3.1-78	A

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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	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	Oil Analysis	VII.F2.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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
Separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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
Separator	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
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
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	A
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-202	3.3.1-45	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.F2.AP-199	3.3.1-46	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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 – 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	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.F2.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.F2.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
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

Table 3.3.2-17-9: Heating Ventilating and Air Conditioning Systems, 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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-272	3.3.1-95	E
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
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 3.3.2-17-10
Control Air System and Service Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-10: Control Air System and Service 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C

Table 3.3.2-17-10: Control Air System and Service 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**
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
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 – 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	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-10: Control Air System and Service 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
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	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
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A

Table 3.3.2-17-10: Control Air System and Service 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
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	A
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.D.A-80	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
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-273	3.3.1-95	C
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.D.A-80	3.3.1-78	A

Table 3.3.2-17-10: Control Air System and Service 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	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	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	Air – indoor (int)	None	None	VII.J.AP-144	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.C1.AP-133	3.3.1-99	C, 302
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

Table 3.3.2-17-10: Control Air System and Service 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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.D.AP-81	3.3.1-56	E
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 3.3.2-17-11
Vacuum Priming System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-11: Vacuum Priming 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flex connection	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	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-11: Vacuum Priming 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	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Separator	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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	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
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
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

Table 3.3.2-17-11: Vacuum Priming 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	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	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-17-12
Generator Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-12: Generator 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
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler housing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Demineralizer	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 3.3.2-17-12: Generator 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**
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Fan housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-127	3.3.1-97	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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	C
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 water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-12: Generator 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**
Flow element	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
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 water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (bonnet)	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 (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
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

Table 3.3.2-17-12: Generator 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**
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Orifice	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Orifice	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	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302

Table 3.3.2-17-12: Generator 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
Pump casing	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
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
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	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	C
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
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	C, 305

Table 3.3.2-17-12: Generator 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**
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	C
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VII.J.AP-15	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	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	C
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	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	C
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-12: Generator 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**
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 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
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.C1.AP-127	3.3.1-97	C, 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	C

Table 3.3.2-17-12: Generator 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
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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 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

Table 3.3.2-17-13
Feedwater Secondary Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-13: Feedwater Secondary Treatment 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-13: Feedwater Secondary Treatment 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.A3.AP-79	3.3.1-125	C, 301
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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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 borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A

Table 3.3.2-17-13: Feedwater Secondary Treatment 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	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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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 borated water (int)	None	None	VII.J.AP-52	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-51	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.A3.AP-79	3.3.1-125	C, 301
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-13: Feedwater Secondary Treatment 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	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 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	C, 301
Tank	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
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	C, 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

Table 3.3.2-17-13: Feedwater Secondary Treatment 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 – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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.A3.AP-79	3.3.1-125	C, 301
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 3.3.2-17-14
Gland Seal Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-14: Gland Seal 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Flex connection	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flex connection	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-14: Gland Seal 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	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	VII.I.A-77	3.3.1-78	A
Pump casing	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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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-51	3.3.1-117	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-14: Gland Seal 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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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	Treated water (int)	Loss of material	Selective Leaching	VIII.E.SP-55	3.4.1-33	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 301

Table 3.3.2-17-15
Station Drainage System and Sewage System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-15: Station Drainage System and Sewage 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flow element	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	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

Table 3.3.2-17-15: Station Drainage System and Sewage 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	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	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
Tank	Pressure boundary	Fiberglass	Air – indoor (ext)	None	None	--	--	G
Tank	Pressure boundary	Fiberglass	Waste water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Tank	Pressure boundary	Fiberglass	Waste water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-15: Station Drainage System and Sewage 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	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-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	A

Table 3.3.2-17-16
Layup Water Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-16: Layup Water Treatment 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Flex connection	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	C
Flex connection	Pressure boundary	Elastomer	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.A4.AP-101	3.3.1-86	C, 310

Table 3.3.2-17-16: Layup Water Treatment 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
Flex connection	Pressure boundary	Elastomer	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.A4.AP-101	3.3.1-86	C, 310
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 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 water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-16: Layup Water Treatment 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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 water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301
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 3.3.2-17-16: Layup Water Treatment 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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
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	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 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)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-17-17
Sampling and Water Quality System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-17: Sampling and Water Quality 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-17: Sampling and Water Quality 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**
Flex connection	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
Flex connection	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Flex connection	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
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	A
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flow element	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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 water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-17-17: Sampling and Water Quality 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	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	C
Heat exchanger (shell)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301

Table 3.3.2-17-17: Sampling and Water Quality 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 > 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.A3.AP-79	3.3.1-125	C, 301
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
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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.A-79	3.3.1-9	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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-17: Sampling and Water Quality 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	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-48	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	Glass	Treated water (int)	None	None	VII.J.AP-51	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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301
Sight glass	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Sight glass	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301

Table 3.3.2-17-17: Sampling and Water Quality 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 water (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-17	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301
Tank	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
Tank	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
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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301
Thermowell	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301

Table 3.3.2-17-17: Sampling and Water Quality 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
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	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
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 301
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E1.A-57	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
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

Table 3.3.2-17-17: Sampling and Water Quality 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 water > 140°F (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
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
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
Tubing	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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.I.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

Table 3.3.2-17-17: Sampling and Water Quality 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	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	Air – indoor (int)	None	None	VII.J.AP-123	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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VII.A3.A-56	3.3.1-124	C, 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	C
Valve body	Pressure boundary	Stainless steel	Treated borated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A3.AP-79	3.3.1-125	C, 301
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 3.3.2-17-17: Sampling and Water Quality 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 > 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)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
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
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 3.3.2-17-18
Turbogenerator Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-18: Turbogenerator 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
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Cooler (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler (bonnet)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	C, 302
Cooler (shell)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-17-18: Turbogenerator 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
Cooler (shell)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-73	3.4.1-14	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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.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.B1.SP-155	3.4.1-16	C, 301

Table 3.3.2-17-18: Turbogenerator 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**
Flow element	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
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-87	3.4.1-16	C, 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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 301
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	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
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302

Table 3.3.2-17-18: Turbogenerator 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	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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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, 301
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-73	3.4.1-14	C, 301
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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
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 3.3.2-17-18: Turbogenerator 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 > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-87	3.4.1-16	C, 301
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Rupture disc	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
Rupture disc	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Rupture disc	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-87	3.4.1-16	C, 301
Sight glass	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Sight glass	Pressure boundary	Aluminum	Lube oil (int)	Cracking	Oil Analysis	--	--	H

Table 3.3.2-17-18: Turbogenerator 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
Sight glass	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	C, 302
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
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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Sight glass	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-73	3.4.1-14	C, 301
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-18: Turbogenerator 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**
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-73	3.4.1-14	C, 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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Tank	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 302
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.C1.AP-127	3.3.1-97	C, 302
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-71	3.4.1-14	C, 301

Table 3.3.2-17-18: Turbogenerator 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**
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-73	3.4.1-14	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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.E1.AP-138	3.3.1-100	C, 302
Tubing	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
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.C.SP-87	3.4.1-16	C, 301

Table 3.3.2-17-18: Turbogenerator 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
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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, 301
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-73	3.4.1-14	C, 301

Table 3.3.2-17-18: Turbogenerator 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	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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 302
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.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.B1.SP-155	3.4.1-16	C, 301
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

Table 3.3.2-17-18: Turbogenerator 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 > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.C.SP-87	3.4.1-16	C, 301

Table 3.3.2-17-19
Hypochlorite System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-19: Hypochlorite 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	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	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	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Piping	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	--	--	G

Table 3.3.2-17-19: Hypochlorite 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	Plastic	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	--	--	F
Piping	Pressure boundary	Plastic	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Piping	Pressure boundary	Plastic	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
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 – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
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-17	3.3.1-120	A

Table 3.3.2-17-19: Hypochlorite 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 water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
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 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	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	C
Valve body	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Valve body	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	--	--	G

Table 3.3.2-17-19: Hypochlorite 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	Plastic	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	--	--	F
Valve body	Pressure boundary	Plastic	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
Valve body	Pressure boundary	Plastic	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
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 – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C

Table 3.3.2-17-20
Injection Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-20: Injection 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301

Table 3.3.2-17-20: Injection 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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	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	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.3.2-17-20: Injection 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**
Tubing	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
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	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
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	C, 301
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	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 > 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)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 301

Table 3.3.2-17-21
Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-21: Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex connection	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
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 water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-21: Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution 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
Heater housing	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	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Piping	Pressure boundary	Aluminum	Treated water (int)	Cracking	Water Chemistry Control – Primary and Secondary	--	--	H
Piping	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.C2.AP-257	3.3.1-23	C, 301
Piping	Pressure boundary	Aluminum	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	--	--	G
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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-21: Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution 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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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 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	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Valve body	Pressure boundary	Aluminum	Treated water (int)	Cracking	Water Chemistry Control – Primary and Secondary	--	--	H

Table 3.3.2-17-21: Demineralized Water and Cask Decon System, and Demineralized Water Storage and Distribution 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	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.C2.AP-257	3.3.1-23	C, 301
Valve body	Pressure boundary	Aluminum	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	--	--	G
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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	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 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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

Table 3.3.2-17-22
Ice Condenser System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-22: Ice Condenser 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	A
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
Chiller housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Chiller 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	C
Condenser (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-17-22: Ice Condenser 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**
Condenser (shell)	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
Cooler housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Cooler 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
Fan housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Fan 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	C
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	C
Flex connection	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-17-22: Ice Condenser 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**
Flex connection	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
Flex connection	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flex connection	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
Flow element	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
Flow element	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	C
Flow element	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	C
Heat exchanger (bonnet)	Pressure boundary	Cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-17-22: Ice Condenser 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 (bonnet)	Pressure boundary	Cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	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.C2.AP-189	3.3.1-46	C
Heater housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heater 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	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	C

Table 3.3.2-17-22: Ice Condenser 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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
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	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Pump casing	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
Separator	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Separator	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
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
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	C

Table 3.3.2-17-22: Ice Condenser 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	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	C
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
Strainer housing	Pressure boundary	Aluminum	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Strainer housing	Pressure boundary	Aluminum	Treated water (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	--	--	H
Strainer housing	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-254	3.3.1-48	C
Strainer housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Strainer 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	C

Table 3.3.2-17-22: Ice Condenser 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	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	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	C
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	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	C
Trap	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Trap	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
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	C

Table 3.3.2-17-22: Ice Condenser 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	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	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	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	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	C
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	C

Table 3.3.2-17-22: Ice Condenser 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	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	C

Table 3.3.2-17-23
Chemical and Volume Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-23: 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	A
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	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Condenser (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	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.E1.A-102	3.3.1-125	A, 301
Condenser (shell)	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A

Table 3.3.2-17-23: 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**
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler housing	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
Cooler housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
Demineralizer	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-102	3.3.1-125	A, 301
Demineralizer	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Ejector	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Ejector	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-23: 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
Ejector	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Evaporator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Evaporator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Evaporator	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Evaporator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Evaporator	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-102	3.3.1-125	A, 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.E1.A-102	3.3.1-125	A, 301

Table 3.3.2-17-23: 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**
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
Flex connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Flex connection	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-102	3.3.1-125	A, 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.E1.A-102	3.3.1-125	A, 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
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A
Heater housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-23: 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
Heater housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Orifice	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-102	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
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	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.A-102	3.3.1-125	A, 301
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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	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 3.3.2-17-23: 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**
Pump casing	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	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.E1.A-102	3.3.1-125	A, 301
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Rupture disc	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-102	3.3.1-125	A, 301
Rupture disc	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-14	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 3.3.2-17-23: 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**
Sight glass	Pressure boundary	Stainless steel	Treated borated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VII.E1.A-102	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.E1.A-102	3.3.1-125	A, 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
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.E1.A-102	3.3.1-125	A, 301
Thermowell	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	Carbon steel	Air – indoor (ext)	Loss of material	Boric Acid Corrosion	VII.E1.A-79	3.3.1-9	A

Table 3.3.2-17-23: 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
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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	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.A-102	3.3.1-125	A, 301
Tubing	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	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

Table 3.3.2-17-23: 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	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	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-102	3.3.1-125	A, 301
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 3.3.2-17-24
Emergency Gas Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-24: Emergency Gas Treatment 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
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	C
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A
Duct	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
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-17-24: Emergency Gas Treatment 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**
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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	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
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	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
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
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

Table 3.3.2-17-24: Emergency Gas Treatment 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 – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	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
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
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.C1.A-47	3.3.1-72	C, 305

Table 3.3.2-17-25
Essential Raw Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-25: Essential Raw 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 – outdoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-126	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-263	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
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	A
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Bolting Integrity	VII.D.AP-121	3.3.1-12	C
Bolting	Pressure boundary	Stainless steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H

Table 3.3.2-17-25: Essential Raw 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**
Flow element	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Flow element	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Flow element	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Flow element	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flow element	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	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 (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	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 3.3.2-17-25: Essential Raw 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	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	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	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A
Pump casing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Thermowell	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-17-25: Essential Raw 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
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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Thermowell	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VII.C1.AP-209	3.3.1-4	A
Thermowell	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.C1.AP-221	3.3.1-6	A
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	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 (int)	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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-17-25: Essential Raw 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**
Tubing	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	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 (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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	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 3.3.2-17-26
Component Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-26: Component 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**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VII.I.AP-125	3.3.1-12	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Condenser (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Condenser (shell)	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Cooler (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler (shell)	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 3.3.2-17-26: Component 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
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 water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
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
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
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

Table 3.3.2-17-26: Component 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
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
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	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	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
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-17-26: Component 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
Thermowell	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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 water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Thermowell	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
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
Tubing	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 3.3.2-17-26: Component 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
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
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	VII.J.AP-17	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
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 3.3.2-17-27
Waste Disposal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-27: Waste Disposal 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Condenser (shell)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	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-278	3.3.1-95	E
Cooler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Cooler housing	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 3.3.2-17-27: Waste Disposal 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
Demineralizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Demineralizer	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
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
Ejector	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Ejector	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
Evaporator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Evaporator	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 3.3.2-17-27: Waste Disposal 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-17	3.3.1-120	C
Evaporator	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
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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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	Air – indoor (int)	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
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-27: Waste Disposal 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	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	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

Table 3.3.2-17-27: Waste Disposal 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	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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
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	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-27: Waste Disposal 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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	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	A
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Rupture disc	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
Separator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Separator	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-17-27: Waste Disposal 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	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
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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Sight glass	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
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
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
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-27: Waste Disposal 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	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	A
Tank	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	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
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

Table 3.3.2-17-27: Waste Disposal 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**
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A
Thermowell	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
Thermowell	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	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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	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	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-17	3.3.1-120	A

Table 3.3.2-17-27: Waste Disposal 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 (int)	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
Tubing	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	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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
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	A

Table 3.3.2-17-27: Waste Disposal 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	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
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-272	3.3.1-95	E
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Waste water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
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 3.3.2-17-27: Waste Disposal 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	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 3.3.2-17-28
Spent Fuel Pit Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-28: Spent Fuel Pit 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
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Demineralizer	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	C
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	A, 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	A, 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	A, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-28: Spent Fuel Pit 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**
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	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.A2.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.A2.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.A2.AP-79	3.3.1-125	A, 301

Table 3.3.2-17-28: Spent Fuel Pit 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**
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	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 3.3.2-17-29
Primary Water Makeup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-17-29: Primary Water 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	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	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 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-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	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

Table 3.3.2-17-29: Primary Water 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
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
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 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-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 3.3.2-17-30
Standby Diesel Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-30: Standby 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
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	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	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-17-30: Standby 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
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
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	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	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.C1.A-47	3.3.1-72	C, 305

Table 3.3.2-17-31
Upper Head Injection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-17-31: Upper Head Injection 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	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	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	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	3.3.1-120	A

Table 3.3.2-17-31: Upper Head Injection 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
Rupture disc	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	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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-17	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
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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	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

Table 3.3.2-17-31: Upper Head Injection 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	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	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E

**Table 3.3.2-17-32
Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.3.2-17-32: 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
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 water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 301
Heat exchanger (bonnet)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Heat exchanger (bonnet)	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 3.3.2-17-32: 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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Heat exchanger (shell)	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-17	3.3.1-120	A
Piping	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	Treated water (int)	None	None	VII.J.AP-51	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 water (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-17	3.3.1-120	C

Table 3.3.2-17-32: 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**
Tank	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
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	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	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	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	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).

- Main Steam (Section 2.3.4.1)
- Main and Auxiliary Feedwater (Section 2.3.4.2)
- Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.4.3)

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 Main Steam System—Summary of Aging Management Evaluation
- Table 3.4.2-2 Main and Auxiliary Feedwater System—Summary of Aging Management Evaluation

Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.4.2-3-1 Main Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-2 Condensate System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-3 Main and Auxiliary Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-4 Extraction Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.4.2-3-5 Heater Drains and Vents System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-6 Turbine Extraction Traps and Drains System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-7 Condensate Demineralizer System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-8 Steam Generator Blowdown System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-9 Condenser Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-3-10 Feedwater Control 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>Main Steam</u>

Materials

Main steam system components are constructed of the following materials.

- Carbon steel
- Copper alloy > 15% zinc or > 8% aluminum
- Nickel alloy
- 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 preload

Aging Management Programs

The following aging management programs manage the aging effects for the main steam system components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.4.2.1.2 Main and Auxiliary Feedwater

Materials

Main and auxiliary feedwater system components are constructed of the following materials.

- Aluminum
- Carbon steel
- Cast iron
- Nickel alloy
- Stainless steel

Environments

Main and auxiliary feedwater system components are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Concrete
- Condensation
- Gas
- Lube oil
- Soil
- Treated water

Aging Effects Requiring Management

The following aging effects associated with the main and auxiliary feedwater system require management.

- Cracking
- Cracking – fatigue
- Loss of material
- Loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the main and auxiliary feedwater system components.

- Aboveground Metallic Tanks
- Bolting Integrity
- Buried and Underground Piping and Tanks Inspection
- Compressed Air Monitoring
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Water Chemistry Control – Primary and Secondary

3.4.2.1.3 Miscellaneous 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 3.4.2-3-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- Carbon steel
- Copper alloy
- Copper alloy > 15% zinc or > 8% aluminum
- Elastomer
- Glass
- Gray cast iron
- Lead
- Nickel alloy
- Stainless steel

Environments

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- Air – indoor
- Air – outdoor
- Lube oil
- Raw water
- Steam
- 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.

- Change in material properties
- Cracking
- Cracking – fatigue
- Loss of material
- Loss of material – wear
- 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
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- 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. The outside air at the SQN site is not conducive to cracking in stainless steel. The SQN site is not near a saltwater coastline, and nearby highways are treated only infrequently with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The SQN cooling tower water is not treated with chlorine or chlorine compounds. The SQN site is in an isolated location, away from agricultural or industrial sources of chloride contamination. Nevertheless, consistent with NUREG-1801, cracking of stainless steel components directly exposed to outdoor air is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program. At SQN, there are no stainless steel steam and power conversion systems components located indoors near unducted air intakes.

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. The outside air at the SQN site is not conducive to loss of material in stainless steel. The SQN site is not near a saltwater coastline, and nearby highways are treated only infrequently with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The SQN cooling tower water is not treated with chlorine or chlorine compounds. The SQN site is in an isolated location, away from agricultural or industrial sources of chloride contamination. Nevertheless, consistent with NUREG-1801, loss of material for stainless steel components directly exposed to outdoor air is identified as an aging effect requiring management and is managed by the External Surfaces Monitoring Program. At SQN, there are no steam and power conversion systems included in the scope of license renewal that are located near unducted air intakes.

3.4.2.2.4 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of SQN quality assurance procedures and administrative controls for aging management programs.

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 the 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

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-3	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
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	Consistent with NUREG-1801. Loss of preload for steel bolting exposed to soil is managed by the Bolting Integrity Program. There is no buried stainless steel bolting 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
3.4.1-7	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	There is no high strength steel bolting in the steam and power conversion systems in the scope of license renewal.
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 closure bolting exposed to indoor and outdoor air is managed by the Bolting Integrity Program. There is no stainless steel bolting exposed to outdoor air in the steam and power conversion systems in the scope of license renewal. 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.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-9	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 Number 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.
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.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-11	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 – Primary and Secondary Program to manage cracking.
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 – Primary and Secondary 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.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-13	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 – Primary and Secondary Program to manage loss of material.
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 – Primary and Secondary 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**
3.4.1-15	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	Consistent with NUREG-1801. Loss of material for steel heat exchanger 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 – Primary and Secondary Program to manage loss of material.
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 aluminum, copper alloy, nickel alloy and 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 – Primary and Secondary 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
3.4.1-17	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	There are no copper alloy or stainless steel 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.
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	Loss of material for copper alloy and stainless steel circulating water system components exposed to raw water will be managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-21	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.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-29	Steel tanks exposed to air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Consistent with NUREG-1801. Loss of material for steel tanks exposed to outdoor air is managed by the Aboveground Metallic Tanks Program.
3.4.1-30	Steel, stainless steel, aluminum tanks exposed to soil or concrete, air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, "Aboveground Metallic Tanks"	No	Consistent with NUREG-1801. Loss of material for steel tanks exposed to concrete or soil is managed by the Aboveground Metallic Tanks Program. Loss of material for stainless steel tanks exposed to outdoor air (applies to components in Table 3.2.2-1 only) is managed by the Aboveground Metallic Tanks Program. There are no aluminum or stainless 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
3.4.1-31	Stainless steel, aluminum tanks exposed to soil or concrete	Loss of material due to pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	Consistent with NUREG-1801. Loss of material for stainless steel tanks exposed to concrete or soil is managed by the Aboveground Metallic Tanks Program. This item applies to components in Table 3.2.2-1. There are no stainless steel or aluminum tanks exposed to concrete or soil in the steam and power conversion systems in the scope of license renewal.
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	This item was not used. There are no gray cast iron 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 and copper alloy (> 15% Zn or > 8% Al) components exposed to treated water or raw water is managed by the Selective Leaching Program. There are no gray cast iron or copper alloy (> 15% Zn or > 8% Al) components exposed to closed-cycle cooling water in the steam and power conversion systems 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 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 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	Consistent with NUREG-1801. Loss of material for steel components exposed to raw water is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-39	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	Loss of material for stainless steel components in the steam and power conversion systems internally exposed to condensation is managed by the Compressed Air Monitoring Program as identified in Table Item 3.3.1-56.
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.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-43	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	Consistent with NUREG-1801. Loss of material for copper alloy 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.
3.4.1-44	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	There are no heat exchanger tubes exposed to lube oil with an intended function of heat transfer 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	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. There are no buried steel tanks, or stainless steel or nickel alloy 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 stainless steel or nickel alloy components buried in 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 stainless steel or nickel alloy components buried in soil 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	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.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-50.5	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 is no underground piping in areas of restricted access in the steam and power conversion systems in the scope of license renewal.
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	Consistent with NUREG-1801 for aluminum components exposed to uncontrolled indoor air. There are no aluminum components exposed to gas 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**
3.4.1-53	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 external copper alloy (≤ 15% Zn and ≤ 8% Al) surfaces exposed to borated water in the steam and power conversion systems.
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	Consistent with NUREG-1801 for copper alloy components exposed to uncontrolled indoor air. There are no copper alloy components exposed to gas 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 glass components exposed to indoor air, raw water and treated water. There are no glass steam and power conversion system components exposed to other environments represented by this item, in the scope of license renewal.
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	Consistent with NUREG-1801.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-57	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 exposed to the environments represented by this item, in the steam and power conversion systems in the scope of license renewal.
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 stainless steel components exposed to indoor air. There are no stainless steel steam and power conversion system components exposed to other environments represented by this item, in the scope of license renewal.
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	Consistent with NUREG-1801 for steel components exposed to gas. There are no steel steam and power conversion system components exposed to controlled indoor air in the scope of license renewal.

Notes for Tables 3.4.2-1 through 3.4.2-3-10

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 the 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. High component surface temperature precludes moisture accumulation that could result in corrosion.

Table 3.4.2-1
Main Steam System
Summary of Aging Management Evaluation

Table 3.4.2-1: 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Bearing housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Bearing housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 401
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H.SP-84	3.4.1-8	I, 403
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	A
Ejector	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: Main Steam System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ejector	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
Flex connection	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VIII.I.SP-11	3.4.1-56	A
Flex connection	Pressure boundary	Nickel alloy	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	--	--	H
Flex connection	Pressure boundary	Nickel alloy	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	A, 401
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H.S-29	3.4.1-34	I, 403
Flow element	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Flow element	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

Table 3.4.2-1: 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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
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
Nozzle	Flow control	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Nozzle	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	Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
Nozzle	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

Table 3.4.2-1: 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	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Orifice	Pressure boundary Flow control	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A
Orifice	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
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 – indoor (ext)	None	None	VIII.H.S-29	3.4.1-34	I, 403
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	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	A

Table 3.4.2-1: 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	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	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
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.B1.SP-155	3.4.1-16	A, 401
Strainer	Filtration	Stainless steel	Steam (ext)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401
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	Filtration	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401

Table 3.4.2-1: 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 (int)	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
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	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 401
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H.S-29	3.4.1-34	I, 403
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
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	VIII.H.S-29	3.4.1-34	I, 403

Table 3.4.2-1: Main Steam System

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	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
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	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	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
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	C, 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 3.4.2-1: 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	Carbon steel	Air – indoor (ext)	None	None	VIII.H.S-29	3.4.1-34	I, 403
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	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
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	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	A, 401

Table 3.4.2-1: 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	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 3.4.2-2
Main and Auxiliary Feedwater System
Summary of Aging Management Evaluation

Table 3.4.2-2: Main and Auxiliary Feedwater 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Bearing housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402
Bearing housing	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
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	A
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VIII.H.SP-141	3.4.1-50	A

Table 3.4.2-2: Main and Auxiliary 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	Soil (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-142	3.4.1-6	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Cavitating venturi	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Cavitating venturi	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Flex connection	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VIII.I.SP-11	3.4.1-56	A
Flex connection	Pressure boundary	Nickel alloy	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Flex connection	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	--	--	G
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.D1.SP-87	3.4.1-16	A, 401

Table 3.4.2-2: Main and Auxiliary Feedwater 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	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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	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.D1.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VIII.I.SP-93	3.4.1-52	A
Piping	Pressure boundary	Aluminum	Treated water (int)	Cracking	Water Chemistry Control – Primary and Secondary	--	--	H
Piping	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-90	3.4.1-16	A, 401

Table 3.4.2-2: Main and Auxiliary 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 – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	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	VIII.H.S-41	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried and Underground Piping and Tanks Inspection	VIII.G.SP-145	3.4.1-47	A
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	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	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	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.D1.SP-87	3.4.1-16	A, 401

Table 3.4.2-2: Main and Auxiliary 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	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.D1.SP-74	3.4.1-13	A, 401
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Aboveground Metallic Tanks	VIII.G.S-31	3.4.1-29	A
Tank	Pressure boundary	Carbon steel	Concrete (ext)	Loss of material	Aboveground Metallic Tanks	VIII.G.SP-116	3.4.1-30	A
Tank	Pressure boundary	Carbon steel	Gas (int)	None	None	VIII.I.SP-4	3.4.1-59	C
Tank	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-115	3.4.1-30	C

Table 3.4.2-2: Main and Auxiliary Feedwater 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	C, 401
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	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
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.A.E-29	3.2.1-44	C
Tubing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402
Tubing	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
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C

Table 3.4.2-2: Main and Auxiliary 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VIII.I.SP-93	3.4.1-52	A
Valve body	Pressure boundary	Aluminum	Treated water (int)	Cracking	Water Chemistry Control – Primary and Secondary	--	--	H
Valve body	Pressure boundary	Aluminum	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-90	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 – 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	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402

Table 3.4.2-2: Main and Auxiliary 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	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	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	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	Cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Cast iron	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	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.D1.SP-118	3.4.1-2	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.D1.SP-127	3.4.1-3	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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-87	3.4.1-16	A, 401

Table 3.4.2-3-1
Main Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-1: 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Flow element	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
Flow element	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VIII.I.SP-11	3.4.1-56	A
Flow element	Pressure boundary	Nickel alloy	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	--	--	H

Table 3.4.2-3-1: 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
Flow element	Pressure boundary	Nickel alloy	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	IV.D1.R-46	3.1.1-2	C
Flow element	Pressure boundary	Nickel alloy	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-157	3.4.1-16	A, 401
Moisture separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Moisture separator	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
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Orifice	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Orifice	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
Orifice	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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-1: 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	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A
Piping	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
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
Rupture disc	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Rupture disc	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A

Table 3.4.2-3-1: 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
Rupture disc	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	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
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.B1.SP-71	3.4.1-14	C, 401
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
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	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

Table 3.4.2-3-1: 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 – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	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
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	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
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
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.4.2-3-1: 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	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-278	3.3.1-95	E
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	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	Flow-Accelerated Corrosion	VIII.B1.S-15	3.4.1-5	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	A

Table 3.4.2-3-1: 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	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	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	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
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	A, 401

Table 3.4.2-3-1: 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	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	A, 401
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 3.4.2-3-2
Condensate System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-2: 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Condenser (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Condenser (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Condenser (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-77	3.4.1-15	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.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-3-2: 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**
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-77	3.4.1-15	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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-78	3.4.1-14	A, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-77	3.4.1-15	A, 401

Table 3.4.2-3-2: 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
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E.SP-88	3.4.1-11	A, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.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
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.E.SP-91	3.4.1-40	A, 402
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	A

Table 3.4.2-3-2: 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**
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E.SP-88	3.4.1-11	A, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
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.E.SP-91	3.4.1-40	A, 402
Pump casing	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
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-2: 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
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VIII.E.SP-27	3.4.1-33	A
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	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
Separator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Separator	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
Separator	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E.SP-88	3.4.1-11	A, 401
Separator	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-2: 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	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	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.E.SP-73	3.4.1-14	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	Lube oil (int)	Loss of material	Oil Analysis	VIII.E.SP-91	3.4.1-40	C, 402
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	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
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C

Table 3.4.2-3-2: 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
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.E.SP-87	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E.SP-88	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (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	Lube oil (int)	Loss of material	Oil Analysis	VIII.E.SP-91	3.4.1-40	A, 402
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-3-2: 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**
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
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.E.SP-88	3.4.1-11	A, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-3-3
Main and Auxiliary Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-3: Main and Auxiliary 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 – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-74	3.4.1-13	A, 401
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Flow element	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A

Table 3.4.2-3-3: Main and Auxiliary 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**
Flow element	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
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	A
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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.D1.SP-88	3.4.1-11	A, 401
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Flow element	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
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-77	3.4.1-15	C, 401

Table 3.4.2-3-3: Main and Auxiliary 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**
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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C.S-15	3.4.1-5	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-71	3.4.1-14	C, 401
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	A
Orifice	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
Orifice	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	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	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	A

Table 3.4.2-3-3: Main and Auxiliary 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**
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	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	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	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
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	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
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.D1.SP-74	3.4.1-13	A, 401

Table 3.4.2-3-3: Main and Auxiliary 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
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	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
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	A
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Trap	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
Trap	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	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	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.E3.A-62	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

Table 3.4.2-3-3: Main and Auxiliary 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 – 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	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	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)	Cracking – fatigue	TLAA – metal fatigue	VIII.D1.S-11	3.4.1-1	A
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 > 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.E3.A-62	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 3.4.2-3-4
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-4: Extraction 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
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.B1.SP-155	3.4.1-16	C, 401
Orifice	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-4: Extraction 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**
Orifice	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-71	3.4.1-14	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	Flow-Accelerated Corrosion	VIII.C.S-15	3.4.1-5	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-71	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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
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.B1.SP-155	3.4.1-16	C, 401

Table 3.4.2-3-4: Extraction 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**
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	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	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.C.SP-71	3.4.1-14	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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
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.B1.SP-155	3.4.1-16	C, 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.C.SP-71	3.4.1-14	A, 401

Table 3.4.2-3-4: Extraction 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	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.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.B1.SP-155	3.4.1-16	C, 401

Table 3.4.2-3-5
Heater Drains and Vents System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-5: Heater Drains and Vents 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Cooler (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Cooler (bonnet)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.G.SP-76	3.4.1-41	C, 402
Cooler (shell)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Cooler (shell)	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-92	3.4.1-43	C, 402
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Expansion joint	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, 401

Table 3.4.2-3-5: Heater Drains and Vents 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**
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Expansion joint	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, 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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 401
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Flow element	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, 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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.4.2-3-5: Heater Drains and Vents 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	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-87	3.4.1-16	C, 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	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	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C.S-15	3.4.1-5	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.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 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	Lube oil (int)	Cracking	Oil Analysis	--	--	H

Table 3.4.2-3-5: Heater Drains and Vents 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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
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.B1.SP-155	3.4.1-16	C, 401
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, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
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, 401
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

Table 3.4.2-3-5: Heater Drains and Vents 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 401
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.B1.SP-74	3.4.1-13	C, 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
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Tank	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
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
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C

Table 3.4.2-3-5: Heater Drains and Vents 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 – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 401
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	C
Tank	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Tank	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-74	3.4.1-13	C, 401
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-92	3.4.1-43	C, 402

Table 3.4.2-3-5: Heater Drains and Vents 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-88	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 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	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	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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

Table 3.4.2-3-5: Heater Drains and Vents 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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.D1.S-16	3.4.1-5	C
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	C, 401
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VIII.E.SP-55	3.4.1-33	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 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	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-3-5: Heater Drains and Vents 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)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.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.B1.SP-88	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.B1.SP-87	3.4.1-16	C, 401

Table 3.4.2-3-6
Turbine Extraction Traps and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-6: Turbine Extraction Traps and Drains 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-98	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.B1.SP-155	3.4.1-16	C, 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

Table 3.4.2-3-6: Turbine Extraction Traps and Drains 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)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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	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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Strainer housing	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	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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C

Table 3.4.2-3-6: Turbine Extraction Traps and Drains 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	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.4.2-3-7
Condensate Demineralizer System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-7: Condensate Demineralizer 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	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Flow element	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	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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-7: Condensate Demineralizer 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	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.E.SP-73	3.4.1-14	A, 401
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	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
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 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.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 3.4.2-3-7: Condensate Demineralizer 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	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VIII.E.SP-55	3.4.1-33	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.A.SP-101	3.4.1-16	C, 401

Table 3.4.2-3-8
Steam Generator Blowdown System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-8: Steam Generator 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
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F.SP-88	3.4.1-11	A, 401
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Flow element	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-87	3.4.1-16	A, 401
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-8: Steam Generator 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**
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.F.S-16	3.4.1-5	C
Heat exchanger (bonnet)	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
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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Heat exchanger (shell)	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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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)	Loss of material	Flow-Accelerated Corrosion	VIII.F.S-16	3.4.1-5	A

Table 3.4.2-3-8: Steam Generator 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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C
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
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	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
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 3.4.2-3-8: Steam Generator 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	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.F.S-16	3.4.1-5	C
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-74	3.4.1-13	C, 401
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	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	C
Thermowell	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	C
Thermowell	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
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	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	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-3-8: Steam Generator 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**
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F.SP-88	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.F.SP-87	3.4.1-16	A, 401
Tubing	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	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	Flow-Accelerated Corrosion	VIII.A.S-15	3.4.1-5	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B1.S-08	3.4.1-1	C

Table 3.4.2-3-8: Steam Generator 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	Flow-Accelerated Corrosion	VIII.F.S-16	3.4.1-5	A
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	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	VIII.I.SP-6	3.4.1-54	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VIII.F.SP-55	3.4.1-33	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Primary and Secondary	VIII.F.SP-101	3.4.1-16	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 > 140°F (int)	Cracking	Water Chemistry Control – Primary and Secondary	VIII.F.SP-88	3.4.1-11	A, 401

Table 3.4.2-3-8: Steam Generator 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	Stainless steel	Treated water > 140°F (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	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.F.SP-87	3.4.1-16	A, 401

Table 3.4.2-3-9
Condenser Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-9: Condenser 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	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F1.AP-102	3.3.1-76	C
Expansion joint	Pressure boundary	Elastomer	Air – indoor (ext)	Loss of material – wear	External Surfaces Monitoring	VII.F1.AP-113	3.3.1-82	C
Expansion joint	Pressure boundary	Elastomer	Raw water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-75	3.3.1-32.5	E

Table 3.4.2-3-9: Condenser 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**
Expansion joint	Pressure boundary	Elastomer	Raw water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-75	3.3.1-32.5	E
Expansion joint	Pressure boundary	Elastomer	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-76	3.3.1-32.5	E
Expansion joint	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VIII.I.SP-11	3.4.1-56	A
Expansion joint	Pressure boundary	Nickel alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C1.AP-206	3.3.1-34	E
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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Flow element	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402

Table 3.4.2-3-9: Condenser 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**
Flow element	Pressure boundary	Lead	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	F
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Piping	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Piping	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.A.SP-31	3.4.1-20	E
Piping	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VIII.A.SP-30	3.4.1-33	C
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-3-9: Condenser 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**
Piping	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-36	3.4.1-20	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Pump casing	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VIII.A.SP-28	3.4.1-33	C
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.A.SP-31	3.4.1-20	E

Table 3.4.2-3-9: Condenser 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	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VIII.A.SP-30	3.4.1-33	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	VIII.I.SP-34	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Strainer housing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-36	3.4.1-20	E
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-3-9: Condenser 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
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-36	3.4.1-20	E
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402

Table 3.4.2-3-9: Condenser 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	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.G.SP-136	3.4.1-38	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	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	VIII.A.SP-31	3.4.1-20	E
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VIII.A.SP-30	3.4.1-33	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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-36	3.4.1-20	E

Table 3.4.2-3-10
Feedwater Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-3-10: Feedwater 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
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-84	3.4.1-8	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
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.D1.SP-91	3.4.1-40	A, 402
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402

Table 3.4.2-3-10: Feedwater 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
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Thermowell	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-95	3.4.1-44	A, 402
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-91	3.4.1-40	A, 402
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-92	3.4.1-43	A, 402
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-3-10: Feedwater 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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.D1.SP-95	3.4.1-44	A, 402
Vapor extractor	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Vapor extractor	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

3.5 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)
- Water Control Structures (Section 2.4.2)
- Turbine Building, Aux/Control 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 Water Control Structures—Summary of Aging Management Evaluation
- Table 3.5.2-3 Turbine Building, Aux/Control 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
- Concrete block
- Dacron fabric (coated with elastomer)
- Elastomer
- Fiber reinforced polyester (FRP)
- Galvanized steel
- Stainless steel

Environments

Reactor building components are exposed to the following environments.

- Air – indoor uncontrolled
- Air – indoor uncontrolled (temperature < 32°F)
- Air – outdoor
- Air with borated water leakage
- Exposed to fluid environment
- Soil

Aging Effects Requiring Management

The following aging effects associated with the reactor building require management.

- Change in material properties
- Cracking
- Cumulative fatigue damage
- Increase in porosity and permeability
- Loss of bond
- Loss of coating integrity
- Loss of leak tightness
- Loss of material
- Loss of sealing
- Loss of strength

Aging Management Programs

The following programs are credited for managing the effects of aging on reactor building components.

- 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
- Masonry Wall
- Periodic Surveillance and Preventive Maintenance
- Protective Coating Monitoring and Maintenance
- Structures Monitoring

3.5.2.1.2 Water Control Structures

Materials

Water control structure components are constructed of the following materials.

- Carbon steel
- Concrete
- Concrete block
- Rock/stone
- Soil

Environments

Water control 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 water control structure components require management.

- Change in material properties
- Cracking
- Cracking and distortion
- Increase in porosity and permeability

- Loss of bond
- Loss of form
- Loss of material
- Loss of strength

Aging Management Programs

The following aging management programs manage the effects of aging on water control structure components.

- Fire Protection
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Masonry Wall
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Structures Monitoring

3.5.2.1.3 Turbine Building, Aux/Control Building and Other Structures

Materials

Turbine building, aux/control building and other structures components are constructed of the following materials.

- Aluminum
- Carbon steel
- Concrete
- Concrete block
- Galvanized steel
- Stainless steel

Environments

Turbine building, aux/control building and other structures components are exposed to the following environments.

- Air – indoor uncontrolled
- Air – outdoor
- Air with borated water leakage
- Exposed to fluid environment
- Soil

Aging Effects Requiring Management

The following aging effects associated with the turbine building, aux/control building and other structures require management.

- Cracking
- Cracking and distortion
- Increase in porosity and permeability
- Loss of bond
- Loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the turbine building, aux/control building and other structures components.

- Boric Acid Corrosion
- Fire Protection
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Masonry Wall
- One-Time Inspection
- Structures Monitoring
- Water Chemistry Control – Primary and Secondary

3.5.2.1.4 Bulk Commodities

Materials

Bulk commodity components are constructed of the following materials.

- Aluminum
- Arlon silicone boot
- Calcium silicate
- Carbon steel
- Carborundum durablanket
- Carborundum fibersil cloth
- Ceraform
- Concrete
- Elastomer
- Fiberboard
- Fiberglass
- Flamemastic
- Galvanized steel
- Kaowool
- Pyrocrete

- 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 bulk commodities require management.

- Change in material properties
- Cracking
- Cracking and distortion
- Cracking/delamination, separation
- Increase in porosity and permeability
- Loss of bond
- Loss of material
- 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
- Containment Leak Rate
- Fire Protection
- Fire Water System
- Inservice Inspection – IWF
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Structures Monitoring

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 SQN 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 SQN containment is a low-leakage, free-standing steel containment vessel (SCV) structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV base foundation (basemat) is integral with the base foundation of the shield building and is founded on bedrock. The bedrock at the SQN site is the Conasauga formation of Middle Cambrian age. The Conasauga formation is composed of interbedded limestone and shale in varying proportions. With a foundation composed of alternating strata of different composition and competency, the configuration of the bedrock surface was irregular. Due to the irregularities of the rock foundation, the area was over excavated a minimum depth of two feet below the required base elevation of the Category I structure's foundation. The excavated area was then covered either by grout or a fill pour of concrete to prevent breakdown of the shale interbeds. This fill pour acted as a grout cap, protecting the shale strata in the bedrock from any tendency to slake or ravel due to prolonged exposure. Therefore, cracking and distortion due to increased stress levels from settlement is not applicable to the SQN SCV base foundation concrete.

SQN does not rely on a dewatering system for control of settlement. The SQN SCV base foundation is founded on bedrock and does not use a porous concrete subfoundation. Additionally, NRC Information Notice (IN) 97-11 did not identify SQN as a plant susceptible to erosion of porous concrete subfoundations. Therefore, reduction of foundation strength and cracking due to differential settlement and erosion of porous concrete subfoundations is not applicable to the SQN SCV base foundation concrete.

3.5.2.2.1.2 Reduction of Strength and Modulus due to Elevated Temperature

The SQN containment is a low-leakage, free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV base foundation is integral with the base foundation of the shield building.

During normal operation, areas within containment are maintained below a general temperature of 150ºF by the reactor building lower compartment cooling system. Process piping carrying hot fluid (pipe temperature > 200ºF) is routed through penetrations in the SCV that are not encased in concrete. Therefore, the local area temperatures greater than 200ºF is not applicable for the SQN containment. Therefore, change in material properties due to elevated temperature is not an aging effect requiring management for containment concrete.

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 SQN containment is a low-leakage, free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV base foundation is integral with the base foundation of the shield building.

   The SCV is a low-leakage, free-standing carbon steel structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SCV is provided with both circumferential and vertical stiffeners on the exterior of the shell. 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.

   IN 2004-09, "Corrosion of Steel Containment and Containment Liner," references the corrosion identified in May 2002 on the SQN steel containment vessel as one of the industry occurrences that led to the issuance of the information notice. The information notice discussion refers to an amendment to Section 50.55a of Title 10 of the Code of Federal Regulations (10 CFR 50.55a) (61 FR 41303). This amendment requires inservice inspections be performed in accordance with the ASME Code, Section XI, Subsections IWE and IWL. The SQN SCV area subject to the corrosion noted in the information notice is subject to general visual examination in accordance with Examination Category E-A item number E1.11.

The SQN moisture barrier is the elastomeric sealant between the concrete-to-metal containment interface. The SQN moisture barrier is covered by a stainless steel thermal barrier. Due to minor corrosion identified under the moisture barrier, the thermal barrier is removed each inspection period to accommodate inspection of the moisture barrier sealant in accordance with Table IWE 2500-1.

The continued monitoring of the SQN 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.

   SQN is a PWR with a free-standing SCV consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN PWR containment does not have a steel torus shell. Therefore, this item does not apply to SQN.

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.

   SQN is a PWR with a free-standing SCV consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN PWR containment does not have a torus ring girder or downcomers. Therefore, this item does not apply to SQN.

3.5.2.2.1.4 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

SQN is a PWR with a free-standing SCV consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV 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 SQN steel containment vessel is not subject to a TLAA. Fatigue TLAAs for bellows are evaluated as documented in Section 4.6.

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 SQN 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 SQN 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. 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 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 Specifications limit the average air temperature inside the primary containment during normal plant operation to 125°F. Therefore, cracking of these components due to stress corrosion cracking is not expected. However, cracking due to SCC of dissimilar metal welds for carbon steel and stainless steel will be managed under the Fatigue Monitoring, Containment Inservice Inspection – IWE, and the Containment Leak Rate Programs.

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking due to Freeze-Thaw

The SQN containment is a low-leakage, free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV base foundation is integral with the base foundation of the shield building. 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.

Therefore, loss of material and cracking due to freeze-thaw are not aging effects requiring management for the SQN SCV base foundation concrete.

3.5.2.2.1.8 Cracking due to Expansion from Reaction with Aggregate

The SQN containment is a low-leakage, free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete.

The SQN SCV base foundation is integral with the base foundation of the shield building.

The SQN SCV base foundation is designed in accordance with ACI 318-63 and constructed in accordance with the recommendations in ACI 318-63 and TVA's general construction specifications using ingredients/materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II along with fly ash (ASTM C618, Class F). Concrete aggregates conform to the requirements of ASTM C33. The aggregate used in the concrete of the SQN components did not come from a region known to yield aggregates suspected of or known to cause aggregate reactions. Materials for concrete used in SQN structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. All aggregates used at SQN conform to the requirements of ASTM C33, "Standard Specification of Concrete Aggregates." Appendix X1 of ASTM C33 identifies methods for evaluating potential reactivity of aggregates, including ASTM C295, ASTM C289, ASTM C227, and ASTM C342. Also, use of a low alkali Portland cement (ASTM C150 Type II) containing less than 0.60 percent alkali calculated as sodium oxide equivalent was required by TVA's general construction specifications and will prevent harmful expansion due to alkali aggregate reaction. Additionally, water/cement ratios were within the limits provided in ACI 318.

Therefore, cracking due to expansion from reaction with aggregate is not an aging effect requiring management for the SQN SCV base foundation concrete.

3.5.2.2.1.9 Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide and Carbonation

The SQN containment is a low-leakage, free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV base foundation is integral with the base foundation of the shield building.

The SQN SCV base foundation is designed in accordance with ACI 318-63 and constructed in accordance with the recommendations in ACI 318-63 and TVA's general construction specifications using ingredients/materials conforming to ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Cracking is controlled through proper arrangement and distribution of reinforcing steel. The SQN SCV base foundation is 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 SQN SCV base foundation is not subject to the flowing water environment necessary for this aging effect to occur. Additionally, the SQN below-grade ground water environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm).

Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation are not aging effects requiring management for the SQN SCV base foundation concrete.

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 SQN Groups 1-3, 5 and 7-9 concrete structures are located in a region where weathering conditions are considered severe as shown in ASTM C33-90, Fig. 1. The concrete structures are designed in accordance with ACI 318-63 and ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63, ACI 318-71 and TVA's general construction specifications using ingredients/ materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II along with fly ash (ASTM C618, Class F). Concrete aggregates conform to the requirements of ASTM C33. The type and size of aggregate, slump, cement and additives have been established to produce durable concrete in accordance with ACI and TVA's general construction specifications. Additionally, water/cement ratios were within the limits provided in ACI 318. TVA's general construction specifications require all concrete to contain an air-entraining agent in sufficient quantity to maintain specified percentages based on nominal maximum size aggregate. Severe weather exposure as described in TVA's general construction specifications is defined as "all exterior surfaces of concrete which will be exposed to alternate wetting and drying." For severe weather exposures, the air content requirements in accordance with TVA's general construction specifications are in accordance with ACI 318-63 and ACI 318-71. TVA's general construction specifications provide a durable concrete that is not subject to freeze-thaw aging effects.

   Therefore, loss of material (spalling, scaling) and cracking due to freeze-thaw in below-grade inaccessible concrete areas are not aging effects that require aging management for SQN Groups 1-3, 5 and 7-9 structures. Below-grade (above the frost line) reinforced concrete will be inspected by the Structures Monitoring Program when excavated for any reason.

2. Cracking due to Expansion and Reaction with Aggregates in Below-Grade Inaccessible Concrete Areas for Groups 1-5 and 7-9 Structures

   The SQN Groups 1-5 and 7-9 concrete structures are designed in accordance with ACI 318-63 and ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63, ACI 318-71 and TVA's general construction specifications using ingredients/materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II along with fly ash (ASTM C618, Class F). Concrete aggregates conform to the requirements of ASTM C33. The aggregate used in the concrete of the SQN components did not come from a region known to yield aggregates suspected of or known to cause aggregate reactions. Materials for concrete used in SQN structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. All aggregates used at SQN conform to the requirements of ASTM C33, "Standard Specification of Concrete Aggregates." Appendix X1 of ASTM C33 identifies methods for evaluating potential reactivity of aggregates, including ASTM C295, ASTM C289, ASTM C227, and ASTM C342. Also, use of a low alkali Portland cement (ASTM C150 Type II) containing less than 0.60 percent alkali calculated as sodium oxide equivalent was required by TVA's general construction specifications and will prevent harmful expansion due to alkali aggregate reaction. Additionally, water/cement ratios were within the limits provided in ACI 318.

   Therefore, cracking due to expansion from reaction with aggregate in below-grade inaccessible concrete areas is not an applicable aging effect for Groups 1-5 and 7-9 structures.

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 Category I Groups 1-3 and 5-9 concrete structures at SQN, except for the diesel generator building, additional diesel generator building, refueling water storage tank foundations, ERCW discharge box, and miscellaneous yard structures, which are founded on soil or compacted structural backfill, are founded on bedrock, piles driven to bedrock, or caissons drilled into the bedrock. The bedrock at the SQN site is the Conasauga formation of Middle Cambrian age. The Conasauga formation is composed of interbedded limestone and shale in varying proportions. With a foundation composed of alternating strata of different composition and competency, the configuration of the bedrock surface was irregular. Due to the irregularities of the rock foundation, the area was over-excavated a minimum depth of two feet below the required base elevation of the

Category I structure's foundation. The excavated area was then covered either by grout or a fill pour of concrete to prevent breakdown of the shale interbeds. This fill pour acted as a grout cap, protecting the shale strata in the bedrock from any tendency to slake or ravel due to prolonged exposure. For the inaccessible concrete of Category I Groups 1-3 and 5-9 structures at SQN that are founded on the bedrock, piles driven to bedrock, or caissons drilled into the bedrock, the aging effect cracking and distortion due to increased stress levels from settlement is not applicable. For SQN structures founded on compacted structural backfill or soil, the aging effect cracking and distortion due to increased stress levels from settlement is conservatively applied as an aging effect requiring management and will be managed by the Structures Monitoring Program.

The Category I Groups 1-3 and 5-9 structures at SQN do not rely on a dewatering system for control of settlement. The Category I Groups 1-3 and 5-9 structures do not use porous concrete subfoundations. Additionally, IN 97-11 did not identify SQN as a plant susceptible to erosion of porous concrete subfoundations.

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 an applicable aging effect for Category I Groups 1-3 and 5-9 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 SQN Groups 1-5 and 7-9 concrete structures are designed in accordance with ACI 318-63 and ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63, ACI 318-71 and TVA's general construction specifications using ingredients/materials conforming to ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and concrete components are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. The SQN Groups 1-5 and 7-9 concrete structures are not subject to the flowing water environment necessary for this aging effect to occur. Additionally, the SQN below-grade ground water environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm).

Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation in below-grade inaccessible concrete areas is not an applicable aging effect for the inaccessible concrete of SQN Groups 1-5 and 7-9 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 SQN Group 1-5 structures are maintained below a general temperature of 150ºF by plant cooling systems. Process piping carrying hot fluid (pipe temperature > 200ºF) routed through penetrations in the concrete walls by design does not result in temperatures exceeding 200ºF locally or in "hot spots" on the concrete surface. The penetration configuration includes guard pipes and insulation of the process piping to minimize heat transfer from the process piping 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 SQN Group 1-5 structures. The aging effect "change in material properties" is equivalent to the NUREG-1801 aging effect "reduction of strength and modulus of elasticity."

3.5.2.2.2.3 Aging Management of Inaccessible Areas for Group 6 Structures

For inaccessible areas of certain Group 6 structures, aging effects are covered by inspections in accordance with the Structures Monitoring program.

1. Loss of Material (Spalling, Scaling) and Cracking due to Freeze-thaw in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   The SQN Group 6 concrete structures are located in a region where weathering conditions are considered severe, as shown in ASTM C33-90, Fig. 1. The concrete structures are designed in accordance with ACI 318-63 and ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63, ACI 318-71, and TVA's general construction specifications using ingredients/ materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II along with fly ash (ASTM C618, Class F). Concrete aggregates conform to the requirements of ASTM C33. The type and size of aggregate, slump, cement and additives have been established to produce durable concrete in accordance with ACI and TVA's general construction specifications. Additionally, water/cement ratios were within the limits provided in ACI 318. TVA's general construction specifications require all concrete to contain an air-entraining agent in sufficient quantity to maintain specified percentages based on nominal maximum size aggregate. Severe weather exposure as described in TVA's general construction specifications is defined as "all exterior surfaces of concrete which will be exposed to alternate wetting and drying." The TVA specified air content for reinforced concrete is in accordance with ACI 318-63 and ACI 318-71. TVA's general construction specifications provide a durable concrete that is not subject to freeze-thaw aging effects.

Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw in below-grade inaccessible concrete areas are not aging effects requiring management for SQN Groups 6 structures.

2. Cracking due to Expansion and Reaction with Aggregates in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   The SQN Group 6 concrete structures are designed in accordance with ACI 318-63 and ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63, ACI 318-71, and TVA's general construction specifications using ingredients/materials conforming to ACI and ASTM standards. The concrete mix uses Portland cement conforming to ASTM C150, Type II along with fly ash (ASTM C618, Class F). Concrete aggregates conform to the requirements of ASTM C33. The aggregate used in the concrete of the SQN components did not come from a region known to yield aggregates suspected of or known to cause aggregate reactions. Materials for concrete used in SQN structures and components were specifically investigated, tested, and examined in accordance with pertinent ASTM standards. All aggregates used at SQN conform to the requirements of ASTM C33, "Standard Specification of Concrete Aggregates." Appendix X1 of ASTM C33 identifies methods for evaluating potential reactivity of aggregates including ASTM C295, ASTM C289, ASTM C227, and ASTM C342. Also, use of a low alkali Portland cement (ASTM C150 Type II) containing less than 0.60 percent alkali calculated as sodium oxide equivalent was required by TVA's general construction specifications and will prevent harmful expansion due to alkali aggregate reaction. Additionally, SQN structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. Water/cement ratios and air entrainment percentages are within the limits provided in ACI 318-63. SQN below-grade ground water and raw water environments are not considered aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm).

   Therefore, cracking due to expansion and reaction with aggregates in below-grade inaccessible concrete areas is not an aging effect requiring management for SQN Group 6 structures.

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 SQN Group 6 concrete structures are designed in accordance with ACI 318-63 and ACI 318-71 and constructed in accordance with the recommendations in ACI 318-63, ACI 318-71, and TVA's general construction specifications using ingredients/materials conforming to ACI and ASTM standards, which provide for a good quality, dense, well-cured, and low permeability concrete. Cracking is controlled through proper arrangement and distribution of reinforcing steel. Concrete structures and concrete components are constructed of a dense, well-cured concrete with an amount of cement suitable for strength development and achievement of a water-to-cement ratio that is characteristic of concrete having low permeability. This is consistent with the recommendations and guidance provided by ACI 201.2R-77. Additionally, the SQN below-grade ground water and raw water environments are not considered aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm).

Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation is not an applicable aging effect requiring management for the inaccessible concrete of SQN Group 6 structures.

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 fluid temperatures are below the threshold value of 140°F (60°C) for stress corrosion cracking. 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 SQN 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 SQN quality assurance procedures and administrative controls for aging management programs.

3.5.2.3 Time-Limited Aging Analyses

There were no TLAAs identified for structural components and commodities. 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 of this application, 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 Structures and Component Supports Evaluated in Chapters II and III of NUREG-1801

Table 3.5.1: Structures and Component Supports					
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	SQN does not rely on a de-watering system to control settlement. SQN has a free-standing steel containment vessel (SCV) structure (herein referred to as containment) consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete supported on a concrete base foundation or basemat founded on bedrock. Therefore, this aging effect and mechanism are not applicable to the SQN containment concrete basemat. For further evaluation see Section 3.5.2.2.1.1.

Table 3.5.1: Structures and Component Supports

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	SQN does not have a porous concrete subfoundation or rely on a de-watering system to control settlement. The SQN containment basemat is founded on bedrock; therefore, these aging effects and mechanisms are not applicable to the SQN containment. 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 SQN containment and concrete basemat are not exposed to general temperatures that exceed the threshold. SQN containment concrete basemat is not exposed to localized temperatures that exceed the threshold. Therefore, these aging effects and mechanisms are not applicable to the SQN containment. For further evaluation see Section 3.5.2.2.1.2.
3.5.1-4	BWR only				

Table 3.5.1: Structures and Component Supports					
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 Containment Leak Rate Programs manage the listed aging effect. 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	SQN is a PWR with a free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete supported on a concrete base foundation or basemat. The SCV concrete basemat is conventionally reinforced. There are no prestressed tendons associated with its design. For further evaluation see Section 3.5.2.2.1.4.

Table 3.5.1: Structures and Component Supports

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. The SQN containment is a free-standing steel containment vessel and does not have a CLB fatigue analysis. Other steel elements, penetration sleeves and bellows are 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: Structures and Component Supports					
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	Listed aging effects do not require management for the SQN concrete basemat. For further evaluation see Section 3.5.2.2.1.7.
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	Listed aging effects do not require management for the SQN concrete basemat. For further evaluation see Section 3.5.2.2.1.8.

Table 3.5.1: Structures and Component Supports

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	Listed aging effects do not require management for the SQN concrete basemat. 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	Listed aging effects do not require management for the SQN concrete basemat. For further evaluation see Section 3.5.2.2.1.9.

Table 3.5.1: Structures and Component Supports

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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.
3.5.1-17	BWR only				

Table 3.5.1: Structures and Component Supports

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	The SQN containment is a low-leakage free-standing SCV structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. The SQN SCV base foundation is integral with the base foundation of the shield building. 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. As a result, loss of material and cracking due to freeze-thaw are not aging effects requiring management for SQN SCV base foundation concrete. The absence of concrete aging effects for the SQN SCV base foundation concrete is confirmed under the Structures Monitoring Program.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. Concrete aggregates conform to the requirements of ASTM C33. The aggregate used in the concrete of the SQN components did not come from a region known to yield aggregates suspected of or known to cause aggregate reactions. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.

Table 3.5.1: Structures and Component Supports

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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.
3.5.1-22	BWR only				

Table 3.5.1: Structures and Component Supports					
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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible and inaccessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible and inaccessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.

Table 3.5.1: Structures and Component Supports

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	Listed aging effects for the SQN SCV concrete basemat do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. 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. The design and construction of these structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible and inaccessible areas. Nonetheless, the concrete basemat component is included in the Structures Monitoring Program to confirm the absence of these aging effects.
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 Program, Containment Leak Rate Program and Structures Monitoring Program manage the listed aging effect.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Consistent with NUREG-1801. The Containment Inservice Inspection – IWE and Containment Leak Rate Programs manage the listed aging effect for penetration sleeves; penetration bellows. The remaining steel elements are specific to BWR containment and SQN is a PWR.
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.
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.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-30	Pressure-retaining bolting	Loss of preload due to self-loosening	ISI (IWE) and 10 CFR Part 50, Appendix J	No	SQN containment pressure-retaining bolting is associated with the securing of the equipment hatch and mounting hardware for the personnel airlocks. These bolts are included as part of the component “Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms” and are addressed by Table 3.5.1 Item 3.5.1-29. The aging effect “Loss of preload due to self-loosening” would result in loss of leak tightness of the pressure boundary; therefore, managing the aging effect “Loss of leak tightness” provides reasonable assurance that the intended function of the containment pressure boundary is maintained and the aging effect “Loss of preload due to self-loosening” is managed in accordance with Table 3.5.1 Item 3.5.1-29.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-31	Pressure-retaining bolting, Steel elements: downcomer pipes	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE)	No	SQN containment pressure-retaining bolting is associated with the securing of the equipment hatch and mounting hardware for the personnel airlocks. These bolts are included as part of the components “Personnel airlock, equipment hatch, CRD hatch” and “Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms” and are addressed by Table 3.5.1 Item 3.5.1-28 and Item 3.5.1-29. The aging effects “Loss of material due to general, pitting and crevice corrosion” and “Loss of leak tightness” will be managed by a combination of the Table 3.5.1 Item 3.5.1-28 and Item 3.5.1-29 for the equipment hatch and personnel airlocks and their mounting hardware, which includes the pressure-retaining bolting of the pressure boundary. Managing these aging effects provides reasonable assurance that the intended function of the containment pressure boundary is maintained and the aging effect “Loss of material due to general, pitting and crevice corrosion” is managed in accordance with Table 3.5.1 Item 3.5.1-28 and Item 3.5.1-29. SQN is a PWR and the SQN containment does not have downcomers.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-32	Prestressing system: tendons; anchorage components	Loss of material due to corrosion	ISI (IWL)	No	SQN has a free-standing SCV containment structure supported on a concrete base foundation or basemat. The SCV concrete basemat is conventionally reinforced. There are no prestressed tendons associated with its design.
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, 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: Structures and Component Supports					
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. The SQN containment configuration does not contain a drywell and the other components associated with the drywell configuration or a 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: Structures and Component Supports					
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	Listed aging effects do not require management at SQN. For further evaluation 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	Listed aging effects do not require management at SQN. For further evaluation see Section 3.5.2.2.2.1 Item 2.

Table 3.5.1: Structures and Component Supports					
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 effects for structures founded on soil. For those structures founded on bedrock, piles or caissons, this aging effect is not applicable. SQN 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				

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Listed aging effects do not require management at SQN. SQN does not have porous concrete subfoundations and does not rely on a de-watering system to control settlement. For further evaluation see Section 3.5.2.2.2.1 Item 3.
3.5.1-47	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	Listed aging effects do not require management at SQN. 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	Listed aging effects do not require management at SQN. SQN concrete in areas for this grouping are not exposed to temperatures that exceed the thresholds. For further evaluation see Section 3.5.2.2.2.2.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Listed aging effects do not require management at SQN. 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	Listed aging effects do not require management at SQN. For further evaluation see Section 3.5.2.2.2.3 Item 2.
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	Listed aging effects do not require management at SQN. For further evaluation see Section 3.5.2.2.2.3 Item 3.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-54	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	Structures Monitoring Program	No	Listed aging effects do not require management at SQN. SQN concrete is designed and constructed in accordance with ACI 318 with air-entrainment. Concrete aggregates conform to the requirements of ASTM C33. The aggregate used in the concrete of the SQN components did not come from a region known to yield aggregates suspected of or known to cause aggregate reactions. The design and construction of these groups of structures at SQN prevents the effect of this aging from occurring; therefore, this aging effect does not require management. Aging effects are not significant for accessible and inaccessible below-grade areas. Nonetheless, components are included in Structures Monitoring Program to confirm the absence of these aging effects.

Table 3.5.1: Structures and Component Supports

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 [Federal Energy Regulatory Commission] FERC/US Army Corp of Engineers dam inspections and maintenance programs.	No	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program manages the listed aging effect.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Loss of mechanical function due to distortion, dirt, overload, fatigue due to vibratory and cyclic thermal loads is not an aging effect requiring management. Such failures typically result from inadequate design or events rather than the effects of aging. Loss of material due to corrosion, which could cause loss of mechanical function, is addressed under Item 3.5.1-91 related to component support members.
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	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program manages the listed aging effects.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program manages the listed aging effects.
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	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program and Structures Monitoring Program manages the listed aging effects.

Table 3.5.1: Structures and Component Supports					
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	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program manages the listed aging effects.
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	NUREG-1801 item referencing this item is associated with Group 6 water-control structures. SQN does not have the component wooden piles; sheeting.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 effects.
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	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effects.
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	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effects.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effects.
3.5.1-68	High-strength structural bolting	Cracking due to stress corrosion cracking	ISI (IWF)	No	Listed aging effects do not require management at SQN. SQN does not have high strength bolts that are subject to sustained high tensile stress in a corrosive environment. High strength bolts used in civil structures have not shown to be prone to SCC. Nonetheless, the bolting components in this listing are included in the Inservice Inspection – IWF Program to confirm the absence of the listed aging effect.

Table 3.5.1: Structures and Component Supports

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	Listed aging effects do not require management at SQN. SQN does not have high strength bolts that are subject to sustained high tensile stress in a corrosive environment. High strength bolts used in civil structures have not shown to be prone to SCC. Nonetheless, the bolting components in this listing are included in the Structures Monitoring Program to confirm the absence of the listed aging effect.
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	Consistent with NUREG-1801. The Masonry Wall Program manages the listed aging effects.
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: Structures and Component Supports

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, 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	Listed aging effect does not require management at SQN. The SQN design does not use Lubrite, graphic tool steel, Fluorogold, or Lubrofluor for the component listed.
3.5.1-75	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	ISI (IWF)	No	Listed aging effect does not require management at SQN. The SQN design does not use Lubrite, graphic tool steel, Fluorogold, or Lubrofluor for the component listed.
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. SQN is a PWR with a free-standing SCV containment and does not have radial beam seats.
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.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.
3.5.1-80	Structural bolting	Loss of material due to general, pitting and crevice corrosion	Structure Monitoring Program	No	Consistent with NUREG-1801. The Structures Monitoring Program manages the listed aging effect.

Table 3.5.1: Structures and Component Supports					
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	Consistent with NUREG-1801. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants 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 is associated with ASME Class MC stainless steel structural bolting in a fluid environment. SQN does not have this component/ material/environment combination.

Table 3.5.1: Structures and Component Supports					
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 is associated with ASME Class 1, 2 and 3 stainless steel structural bolting in a fluid environment. SQN does not have this component/ material/environment combination.
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.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-87	Structural bolting	Loss of preload due to self-loosening	ISI (IWF)	No	Vibration, flexing of the joint, cyclic shear loads, thermal cycles and other causes can cause partial self-loosening of a fastener. These causes of loosening are minor contributors in structural steel and steel component threaded connections and are eliminated by initial preload bolt torquing. SQN uses site procedures and manufacturer recommendations to provide guidance for proper torquing of nuts and bolts used in structural applications. Additionally, SQN site operating experience has not shown self-loosening of structural bolting used in SQN. Therefore, loss of preload due to self-loosing is not an aging effect requiring management for structural steel and steel component threaded fasteners within the scope of license renewal.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-88	Structural bolting	Loss of preload due to self-loosening	Structures Monitoring Program	No	Vibration, flexing of the joint, cyclic shear loads, thermal cycles and other causes can cause partial self-loosening of a fastener. These causes of loosening are minor contributors in structural steel and steel component threaded connections and are eliminated by initial preload bolt torquing. SQN uses site procedures and manufacturer recommendations to provide guidance for proper torquing of nuts and bolts used in structural applications. Additionally, SQN site operating experience has not shown self-loosening of structural bolting used in SQN. Therefore, loss of preload due to self-loosing is not an aging effect requiring management for structural steel and steel component threaded fasteners within the scope of license renewal.
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.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	NUREG-1801 item referencing this item is associated with Class 1 steel; stainless steel support members; welds; bolted connections; support anchorage to building structure in a fluid environment. SQN does not have this component/ material/environment combination.
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	Consistent with NUREG-1801. The Structures Monitoring Program manages 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.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Consistent with NUREG-1801. The Structures Monitoring Program is substituted for the Inservice Inspection – IWF Program and manages the listed aging effects. Note: SQN does not have ASME vibration isolation elements.
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.

<u>Notes for Table 3.5.2-1 through 3.5.2-4</u>

<u>Generic Notes</u>

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.

<u>Plant-Specific Notes</u>

501. Not used

502. Material is encapsulated within a stainless steel sheet steel panel.

503. Loss of insulating characteristics due to insulation degradation is not an aging effect requiring management for insulation material. Insulation products, which are made from fiberglass fiber, calcium silicate, stainless steel, and similar materials, in an air – indoor uncontrolled environment do not experience aging effects that would significantly degrade their ability to insulate as designed. A review of site operating experience identified no aging effects for insulation used at SQN.

504. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control – Primary and Secondary Program.

505. The spent fuel pool water level is monitored in accordance with Technical Specifications 3.9.11 and 4.9.11. The leak chase channels will be monitored for leakage during routine operator rounds.

Table 3.5.2-1
Reactor Building
Summary of Aging Management Evaluation

Table 3.5.2-1: Reactor Building								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cranes: rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL (1)	VII.B.A-05 VII.B.A-07	3.3.1-53 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 (Section 4.7.2)	VII.B.A-06	3.3.1-1	A
Penetration sleeves	EN, 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, PB, MB, SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Penetration sleeves: sleeve and bellows	EN, PB, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Penetration sleeves: sleeve and bellows	EN, PB, SSR	Carbon steel, Stainless steel	Air – indoor uncontrolled	Cracking	CII-IWE Containment Leak Rate	II.A3.CP-37 II.A3.CP-38	3.5.1-27 3.5.1-10	A

1. “Inspection of OVHLL” refers to the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program.

Table 3.5.2-1: Reactor Building

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Penetration sleeves: sleeve and bellows	EN, PB, SSR	Stainless steel	Air – indoor uncontrolled	Cumulative fatigue damage	TLAA (Section 4.6)	II.A3.C-13	3.5.1-9	A
Personnel airlock, equipment hatch	EN, HS, MB, 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
Personnel airlock, equipment hatch	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21 VII.G.AP-150	3.3.1-59 3.3.1-58	A C
Personnel airlock, equipment hatch: locks, hinges, and closure mechanisms	EN, HS, MB, PB, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of leak tightness	CII-IWE Containment Leak Rate	II.A3.CP-39	3.5.1-29	A
Personnel airlock, equipment hatch: locks, hinges, and closure mechanisms	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21 VII.G.AP-150	3.3.1-59 3.3.1-58	A C
Beams, columns and base plates	HS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Beams, columns and base plates	HS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Containment sump liner plates	EN, HS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C

Table 3.5.2-1: Reactor Building

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Containment sump liner plates	EN, HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
CRDM support structure	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI-IWF	III.B1.1.T-24	3.5.1-91	A
Ice baskets	HS, SSR	Galvanized steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Ice baskets lattice support frames	HS, SSR	Galvanized steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Intermediate deck and top deck of ice condenser	IN, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Intermediate deck and top deck of ice condenser	IN, SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Kick plates and curbs	DF	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302	3.5.1-77	A
Kick plates and curbs	DF	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Lower inlet doors	DF, EN, HS, IN, MB, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A

Table 3.5.2-1: Reactor Building								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Lower inlet doors	DF, EN, HS, IN, MB, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Lower inlet doors	DF, EN, HS, IN, MB, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Lower inlet doors	DF, EN, HS, IN, MB, SRE, SSR	Stainless steel	Air with borated water leakage	None	None	III.B5.TP-4	3.5.1-95	A
Lower support structure structural steel: beams, columns, plates	HS, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Personnel access doors, equipment access floor hatch and escape hatches	DF, HS, IN, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Personnel access doors, equipment access floor hatch and escape hatches	DF, HS, IN, SNS, SRE, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A

Table 3.5.2-1: Reactor Building

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pressure relief panels	EN, HS, PR, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Pressure relief panels	EN, HS, PR, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Steel liner plate	EN, HS, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Steel liner plate	EN, HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Sump screens	EN, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C
Sump screens	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Thermal barrier	DF, EN, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	C
Thermal barrier	DF, EN, SSR	Stainless steel	Air with borated water leakage	None	None	III.B2.TP-4	3.5.1-95	C
Turning vanes	DF, EN, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A4.TP-302	3.5.1-77	A
Wall panels	EN, IN, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C

Table 3.5.2-1: Reactor Building								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Steel elements (accessible areas): liner; liner anchors; integral attachments (steel containment vessel)	EN, HS, MB, 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, MB, 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, MB, 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

Table 3.5.2-1: Reactor Building								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Support members: welds; bolted connections; support anchorage to building structure (supports and restraints for the steam generators, pressurizer, and reactor coolant pumps)	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)	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

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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)	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)	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

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Beams, columns, floor slabs and interior walls (reactor cavity and primary shield walls; pressurizer and reactor coolant pump compartments; steam generator compartments; refueling canal, crane wall, and missile shield slabs and barriers)	DF, 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

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Beams, columns, floor slabs and interior walls (reactor cavity and primary shield walls; pressurizer and reactor coolant pump compartments; steam generator compartments; refueling canal, crane wall, and missile shield slabs and barriers)	DF, 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
Canal gate bulkhead	DF, EN, HS, MB, 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
Canal gate bulkhead	DF, EN, HS, MB, 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

Table 3.5.2-1: Reactor Building								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
CRD missile shield	DF, EN, HS, MB, 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
CRD missile shield	DF, EN, HS, MB, 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 shield blocks	EN, HS, SRE, SSR	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A1.T-12	3.5.1-70	A
Curbs	DF	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
Curbs	DF	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

Table 3.5.2-1: Reactor Building

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Ice condenser support floor (including wear slab)	DF, EN, HS, IN, 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
Ice condenser support floor (including wear slab)	DF, EN, HS, IN, 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, HS, 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
Concrete (accessible areas): Shield building wall and dome; interior and above-grade exterior	EN, FLB, HS, 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.A1.TP-28	3.5.1-67	A
Concrete (accessible areas): Shield building wall and dome; interior	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.5.1-60	A

Table 3.5.2-1: Reactor Building

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete (accessible areas): Shield building wall and dome; interior	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A
Concrete (accessible areas): Shield building; exterior above and below grade; foundation	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A1.TP-23	3.5.1-64	A
Concrete (accessible areas): Shield building; below grade exterior; foundation	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-27	3.5.1-65	A
Concrete (inaccessible areas): Shield building; below grade exterior; foundation	EN, FLB MB, PB, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-212	3.5.1-65	A
Concrete (inaccessible areas): Shield building; below grade exterior; foundation	EN, FLB MB, PB, SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A1.TP-29	3.5.1-67	A

Table 3.5.2-1: Reactor Building								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (accessible areas): Shield building; ring tension beam: interior and above-grade exterior	EN, HS, 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
Concrete (accessible areas): Shield building; ring tension beam: interior and above grade exterior	EN, HS, 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.A1.TP-28	3.5.1-67	A
Sumps	EN, 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
Sumps	EN, 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
Sumps	EN, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability, loss of strength	Structures Monitoring	III.A4.TP-24	3.5.1-63	A

Table 3.5.2-1: Reactor Building

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Lower inlet doors	DF, EN, HS, IN, MB, SRE, SSR	Fiber reinforced polyester (FRP)	Air – indoor uncontrolled	None	None	--	--	J, 502
Moisture barrier	DF, EN, SSR	Elastomer	Air – indoor uncontrolled	Loss of sealing	CII-IWE	II.A3.CP-40	3.5.1-26	A
Seal between the upper and lower compartments (divider barrier)	SSR	Dacron fabric (coated with elastomer)	Air – indoor uncontrolled	Loss of material, Cracking Change in material properties	Periodic Surveillance and Preventive Maintenance	--	--	J
Service level I coatings	SNS	Coatings	Air – indoor uncontrolled	Loss of coating integrity	Protective Coating Monitoring and Maintenance	II.A3.CP-152 III.A4.TP-301	3.5.1-34 3.5.1-73	A

Table 3.5.2-2
Water Control Structures
Summary of Aging Management Evaluation

Table 3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pedestal crane	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Steel liner plate	EN, HS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Steel liner plate	EN, HS, SSR	Carbon steel	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Steel sheet piles for cells a thru f and 12	SNS, SSR	Carbon steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Steel sheet piles for cells a thru f and 12	SNS, SSR	Carbon steel	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Steel sheet piles for cells a thru f and 12	SNS, SSR	Carbon steel	Soil	Loss of material	Structures Monitoring	III.A3.TP-219	3.5.1-79	A
Structural steel: beams, columns, plates	EN, HS, MB, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Structural steel: beams, columns, plates	EN, HS, MB, SRE, SNS, SSR	Carbon steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C

Table 3.5.2-2: Water Control Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Structural steel: beams, columns, plates	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	C
Structural steel: beams, columns, plates	FB	Carbon steel	Air – outdoor	Loss of material	Fire Protection	--	--	H
Trash racks	EN, HS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Trash racks	EN, HS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Trash racks	EN, HS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Trash racks associated structural support framing	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Trash racks associated structural support framing	SSR	Carbon steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Trash racks associated structural support framing	SSR	Carbon steel	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C

Table 3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Traveling screen casing and associated structural support framing	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Traveling screen casing and associated structural support framing	SNS	Carbon steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Traveling screen casing and associated structural support framing	SNS	Carbon steel	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
Beams, columns, floor slabs and interior walls	EN, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
Beams, columns, floor slabs and interior walls	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Beams, columns, floor slabs and interior walls	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A

Table 3.5.2-2: Water Control Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete (accessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor or Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
Concrete (accessible areas): all	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Concrete (accessible areas): all	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A
Concrete (accessible areas): all	FB	Concrete	Air – outdoor	Cracking, loss of material	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	A
Concrete (accessible areas): all	FB	Concrete	Air – outdoor	Loss of material	Fire Protection Structures Monitoring	VII.G.A-93	3.3.1-62	A
Concrete (accessible areas): exterior above- and below-grade; foundation	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	RG 1.127	III.A6.TP-36	3.5.1-60	A
Concrete (inaccessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor or Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-104	3.5.1-65	A

Table 3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (inaccessible areas): all	EN, FLB, HS, MB, SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-107	3.5.1-67	A
Cable tunnel	MB, SRE	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
Cable tunnel	MB, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A6.TP-30	3.5.1-44	A
Cable tunnel	MB, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-104	3.5.1-65	A
Cable tunnel	MB, SRE	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-107	3.5.1-67	A
Concrete cover for the rock walls of approach channel	EN, SNS	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A

Table 3.5.2-2: Water Control Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete cover for the rock walls of approach channel	EN, SNS	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	RG 1.127	III.A6.TP-36	3.5.1-60	A
Concrete cover for the rock walls of approach channel	EN, SNS	Concrete	Exposed to fluid environment	Increase in porosity and permeability, loss of strength	RG 1.127	III.A6.TP-37	3.5.1-61	A
Concrete cover for the rock walls of approach channel	EN, SNS	Concrete	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.T-20	3.5.1-56	A
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	RG 1.127	III.A6.TP-36	3.5.1-60	A
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Exposed to fluid environment	Loss of Material	RG 1.127	III.A6.T-20	3.5.1-56	A
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability, loss of strength	RG 1.127	III.A6.TP-37	3.5.1-61	A
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A6.TP-30	3.5.1-44	A

Table 3.5.2-2: Water Control Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-104	3.5.1-65	A
Discharge box and foundation	EN, MB, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-107	3.5.1-67	A
Exterior concrete slabs and concrete caps	MB, SRE	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
Exterior concrete slabs and concrete caps	MB, SRE	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	RG 1.127	III.A6.TP-36	3.5.1-60	A
Exterior concrete slabs and concrete caps	MB, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A6.TP-30	3.5.1-44	A
Exterior concrete slabs and concrete caps	MB, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-104	3.5.1-65	A

Table 3.5.2-2: Water Control Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Exterior concrete slabs and concrete caps	MB, SRE	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A6.TP-107	3.5.1-67	A
Sumps	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
Sumps	SNS, SRE, SSR	Concrete	Exposed to fluid environment	Increase in porosity and permeability, loss of strength	RG 1.127	III.A6.TP-37	3.5.1-61	A
Masonry walls	EN, SNS, SRE, SSR	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A6.T-12	3.5.1-70	A
Masonry walls (fire barriers)	FB	Concrete block	Air – indoor uncontrolled	Cracking	Fire Protection Masonry Wall	VII.G.A-90	3.3.1-60	E
Masonry walls (fire barriers)	FB	Concrete block	Air – indoor uncontrolled	Loss of material	Fire Protection Masonry Wall	VII.G.A-91	3.3.1-62	E
Earthen embankment	EN, SSR	Soil	Air – outdoor	Loss of form; Loss of material; Change in material properties	RG 1.127	--	--	G

Table 3.5.2-2: Water Control Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Earthen embankment	EN, SSR	Soil	Exposed to fluid environment	Loss of form; Loss of material	RG 1.127	III.A6.T-22	3.5.1-58	A
Riprap	EN, SNS	Rock/stone	Air – outdoor	Loss of form; Loss of material	RG 1.127	--	--	G
Riprap	EN, SNS	Rock/stone	Exposed to fluid environment	Loss of form; Loss of material	RG 1.127	III.A6.T-22	3.5.1-58	A
Rock embankment	EN, SSR	Rock/stone	Air – outdoor	Loss of form; Loss of material	RG 1.127	--	--	G
Rock embankment	EN, SSR	Rock/stone	Exposed to fluid environment	Loss of form; Loss of material	RG 1.127	III.A6.T-22	3.5.1-58	A

Table 3.5.2-3
Turbine Building, Aux/Control Building and Other Structures
Summary of Aging Management Evaluation

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cranes rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-05 VII.B.A-07	3.3.1-53 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
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
Explosion bolts	PR, SSR	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.TP-3	3.5.1-89	A
Explosion bolts	PR, SSR	Aluminum	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Explosion bolts	PR, SSR	Aluminum	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	A
Metal siding	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Metal siding	SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Monorails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
New fuel storage racks	SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C
Pressure relief or blowout panels	PR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Pressure relief or blowout panels	PR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Roof decking or floor decking	PR, SSR	Carbon steel	Air – indoor uncontrolled or Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Roof decking or floor decking	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	C
RWST rainwater diversion skirt	SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Spent fuel pool gate	SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Spent fuel pool gate	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – Primary and Secondary, monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels	III.A5.T-14	3.5.1-78	A, 505
Spent fuel pool liner plate	SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	C
Spent fuel pool liner plate	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – Primary and Secondary, monitoring of the spent fuel pool water level in accordance with technical specifications and leakage from the leak chase channels	III.A5.T-14	3.5.1-78	A, 505

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Spent fuel storage racks	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – Primary and Secondary	VII.A2.A-99	3.3.1-125	A, 504
Steel H-bearing piles	SSR	Carbon steel	Soil	Loss of material	Structures Monitoring	III.A3.TP-219	3.5.1-79	A
Steel plate missile barrier	MB	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Structural steel: beams, columns, plates	EN, MB, SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Structural steel: beams, columns, plates	EN, MB, SRE, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Structural steel: beams, columns, plates	EN, MB, SRE, SNS, SSR	Carbon steel	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.T-25	3.5.1-89	A
Sump liners	SNS, SRE, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	A
Transmission towers, Angle tower, Pull-off tower	SRE	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4.TP-6	3.5.1-93	C
Concrete (accessible areas): 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.A3.TP-26	3.5.1-66	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (accessible areas): interior and above-grade exterior	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.A3.TP-28	3.5.1-67	A
Concrete (accessible areas): interior and above-grade exterior	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Concrete (accessible areas): interior and above-grade exterior	FB	Concrete	Air – outdoor	Loss of material	Fire Protection Structures Monitoring	VII.G.A-93	3.3.1-62	A
Concrete (accessible areas): interior and above-grade exterior	FB	Concrete	Air – outdoor	Cracking, loss of material	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	A
Concrete (accessible areas): interior and above-grade exterior	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Concrete (accessible areas): exterior above- and below-grade; foundation	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A
Concrete (accessible areas); below-grade exterior; foundation	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-27	3.5.1-65	A
Concrete (inaccessible areas); below-grade exterior; foundation	EN, FLB, MB, PB, SNS, SRE, SSR	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): below-grade exterior; foundation	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Beams, columns, floor slabs and interior walls	EN, MB, PB, SNS, SRE, SSR	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, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Beams, columns, floor slabs and interior walls	EN, MB, PB, SNS, SRE, SSR	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
Beams, columns, floor slabs and interior walls	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Beams, columns, floor slabs and interior walls	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A
Cable tunnel	MB, 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
Cable tunnel	MB, 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
Cable tunnel	MB, SRE	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Cable tunnel	MB, SRE	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A
Cable tunnel	MB, 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
Concrete slab (missile barrier)	MB	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Concrete slab (missile barrier)	MB	Concrete	Air – outdoor	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A7.TP-28	3.5.1-67	A
Concrete slab (missile barrier)	MB	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A7.TP-23	3.5.1-64	A
Concrete slab (missile barrier)	MB	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A7.TP-30	3.5.1-44	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Concrete slab (missile barrier)	MB	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A7.TP-212	3.5.1-65	A
Concrete slab (missile barrier)	MB	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A7.TP-29	3.5.1-67	A
Duct banks	EN, SNS, SRE, SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Duct banks	EN, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A
Duct banks	EN, SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE, SSR	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, SSR	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, SSR	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, SSR	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE, SSR	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

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Foundations (e.g., switchyard, transformers, tanks, circuit breakers)	SNS, SRE, SSR	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, SNS, SRE, SSR	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, SNS, SRE, SSR	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, SNS, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A
Manholes and handholes	FB	Concrete	Air – outdoor	Cracking, loss of material	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	A
Manholes and handholes	FB	Concrete	Air – outdoor	Loss of material	Fire Protection Structures Monitoring	VII.G.A-93	3.3.1-62	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Manholes and handholes	EN, SNS, SRE, SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Manholes and handholes	EN, SNS, SRE, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A
Manholes and handholes	EN, SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Pipe tunnel	MB, PB, SSR	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
Pipe tunnel	MB, PB, SSR	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
Pipe tunnel	MB, PB, SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pipe tunnel	MB, PB, SSR	Concrete	Soil	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-212	3.5.1-65	A
Pipe tunnel	MB, PB, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Precast bulkheads	MB, SSR	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Precast bulkheads	MB, SSR	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
Precast bulkheads	MB, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Roof slabs	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor or Air – indoor uncontrolled	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Roof slabs	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor or 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
Roof slabs	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A
Roof slabs	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	A
Roof slabs	FB	Concrete	Air – indoor uncontrolled	Loss of material	Fire Protection Structures Monitoring	VII.G.A-91	3.3.1-62	A
Roof slabs	FB	Concrete	Air – outdoor	Cracking, loss of material	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	A

Table 3.5.2-3: Turbine Building, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Roof slabs	FB	Concrete	Air – outdoor	Loss of material	Fire Protection Structures Monitoring	VII.G.A-93	3.3.1-62	A
RWST storage basin	SSR	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
RWST storage basin	SSR	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
RWST storage basin	SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A
RWST storage basin	SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
RWST storage basin	SSR	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, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
RWST storage basin	SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Sumps	SNS, SRE, SSR	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
Sumps	SNS, SRE, SSR	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
Sumps	SNS, SRE, SSR	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Sumps	SNS, SRE, SSR	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, Aux/Control Building and Other Structures

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sumps	SNS, SRE, SSR	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Trenches	EN, SNS	Concrete	Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-26	3.5.1-66	A
Trenches	EN, SNS	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
Trenches	EN, SNS	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	A
Trenches	EN, SNS	Concrete	Soil	Cracking and distortion	Structures Monitoring	III.A3.TP-30	3.5.1-44	A
Trenches	EN, SNS	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, Aux/Control Building and Other Structures								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Trenches	EN, SNS	Concrete	Soil	Increase in porosity and permeability, cracking, loss of material (spalling, scaling)	Structures Monitoring	III.A3.TP-29	3.5.1-67	A
Masonry walls	EN, SNS, SRE, SSR	Concrete block	Air – indoor uncontrolled or Air – outdoor	Cracking	Masonry Wall	III.A3.T-12	3.5.1-70	A
Masonry walls	EN, SNS, SRE, SSR	Concrete block	Air – outdoor	Loss of material	Masonry Wall	III.A5.TP-34	3.5.1-71	A
Masonry walls (fire barriers)	FB	Concrete block	Air – indoor uncontrolled	Cracking	Fire Protection Masonry Wall	VII.G.A-90	3.3.1-60	E
Masonry walls (fire barriers)	FB	Concrete block	Air – indoor uncontrolled	Loss of material	Fire Protection Masonry Wall	VII.G.A-91	3.3.1-62	E
Masonry walls (fire barriers)	FB	Concrete block	Air – outdoor	Cracking, loss of material	Fire Protection Masonry Wall	VII.G.A-92	3.3.1-61	E
Masonry walls (fire barriers)	FB	Concrete block	Air – outdoor	Loss of material	Fire Protection Masonry Wall	VII.G.A-93	3.3.1-62	E

Table 3.5.2-4
Bulk Commodities
Summary of Aging Management Evaluation

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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	3.5.1-77	C
						III.B2.TP-43	3.5.1-92	
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	Air – indoor uncontrolled	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	C
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
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

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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
Doors	EN, FLB, PB, MB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A4.TP-302	3.5.1-77	C
						III.A6.TP-248	3.5.1-80	
Doors	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.A-21	3.3.1-59	A
Doors	EN, FLB, PB, MB	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302	3.5.1-77	C
Doors	EN, FLB, PB, MB	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

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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 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
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	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	SNS, SSR	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	3.5.1-77	C

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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
Mirror insulation	IN, SNS	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-17	3.3.1-120	C
Mirror insulation	IN, 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, 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	3.5.1-77	C
			Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A6.TP-248	3.5.1-80	C

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, stairs, vents and louvers, framing steel, etc.)	EN, FLB, SNS, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	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

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Miscellaneous steel (decking, grating, handrails, ladders, enclosure plates, 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	3.5.1-77	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	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
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

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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 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	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	Stainless steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5.1-95	C

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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
Racks, panels, cabinets and enclosures for electrical equipment and instrumentation	EN, SNS, SRE, SSR	Stainless steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4.TP-6	3.5.1-93	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 with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C
Tube track	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**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	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
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	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

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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
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	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	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

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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
						III.B3.TP-43 III.B5.TP-43	3.5.1-92	
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 with borated water leakage	None	None	III.B2.TP-4 III.B3.TP-4	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
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

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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
Anchor bolts	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	A
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	RG 1.127	III.A6.TP-221	3.5.1-83	A
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 – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	A

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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	RG 1.127	III.A6.TP-221	3.5.1-83	A
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
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	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	A
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	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

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	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)	SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8	3.5.1-95	A
High strength structural bolting (Supports for ASME Class 1, 2, and 3 piping and components)	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

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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 – 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
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								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**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	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 – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	A

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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 with borated water leakage	Loss of material	Boric Acid Corrosion	III.B5.TP-3	3.5.1-89	C

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	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 – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A3.TP-274 III.A4.TP-274	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	Galvanized steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	A

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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.A6.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	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
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.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	RG 1.127	III.A6.TP-221	3.5.1-83	A
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

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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
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.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	Galvanized steel	Air – outdoor	Loss of material	RG 1.127	III.A6.TP-221	3.5.1-83	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

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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.B1.1.TP-235 III.B1.2.TP-235	3.5.1-86	A
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
Building concrete at locations of expansion and grouted anchors; grout pads for support base plates	SNS, SSR, SRE	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

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled or Air – outdoor	Cracking, loss of bond, and loss of material (spalling, scaling)	RG 1.127	III.A6.TP-38	3.5.1-59	A
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 – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A1.TP-23 III.A3.TP-23 III.A5.TP-23	3.5.1-64	A
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – outdoor	Loss of material (spalling, scaling) and cracking	RG 1.127	III.A6.TP-36	3.5.1-60	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

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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
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
						III.A6.TP-104	3.5.1-65	
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	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

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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
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
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
						III.A6.TP-104	3.5.1-65	

Table 3.5.2-4: Bulk Commodities								
Structure and/or Component or Commodity	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**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 – outdoor	Loss of material (spalling, scaling) and cracking	Structures Monitoring	III.A3.TP-23	3.5.1-64	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	Carborundum durablanket, carborundum fibersil cloth, Arlon silicone boot, ceraform, kaowool, fiberboard, elastomers	Air – indoor uncontrolled	Loss of material, Change in material properties, Cracking/ delamination, separation	Fire Protection	--	--	J

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fire wrap	FB	Carborundum durablanket, carborundum fibersil cloth, Arlon silicone boot, Thermo-lag, Flamemastic, Pyrocrete	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)	IN, SNS	Fiberglass, calcium silicate	Air – indoor uncontrolled	None	None	--	--	J, 503
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	IN, 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)	IN, SNS	Aluminum	Air with borated water leakage	Loss of material	Boric Acid Corrosion	III.B2.TP-3	3.5.1-89	C
Insulation (includes jacketing, wire mesh, tie wires, straps, clips)	IN, SNS	Stainless steel	Air – indoor uncontrolled	None	None	VII.J.AP-17	3.3.1-120	C

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
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	Cracking and change in material properties, Loss of sealing	Fire Protection	VII.G.A-19	3.3.1-57	A
Penetration seals	EN, FLB, PB, SNS	Elastomers	Air – indoor uncontrolled or Air – outdoor	Cracking and change in material properties, 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	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
					Containment Leak Rate	II.A3.CP-41	3.5.1-33	A
Seals and gaskets (doors, manways and hatches)	FLB, PB, SSR	Elastomers	Air – outdoor	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Seismic/expansion joint	SSR	Elastomers	Air – outdoor	Loss of sealing	Structures Monitoring	III.A6.TP-7	3.5.1-72	C

Table 3.5.2-4: Bulk Commodities

Structure and/or Component or Commodity	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Seismic/expansion joint	SSR	Fiberglass	Air – outdoor	None	None	--	--	J
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 electrical components that are 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. 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
  - Electrical and I&C penetration cables and connections not subject to 10 CFR 50.49 EQ requirements
  - Fuse holders (insulation material)
  - Non-EQ fuse holder (metallic portion)
  - Inaccessible power (400 V to 35 kV) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements
  - Inaccessible power (161 kV) 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, 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.

Materials

Electrical and I&C components subject to aging management review are constructed of the following materials.

- Aluminum
- Copper
- Cement
- Elastomer
- Galvanized metals
- Insulation material – various organic polymers
- Insulation material – oil
- 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
- Insulating oil
- Significant moisture

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- Change in material properties
- Cracking
- Increased resistance of connection
- 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
- Non-EQ Cable Connections
- Non-EQ Inaccessible Power Cables (400 V to 35 kV)
- Oil-Filled Cable System (161 kV)
  - External Surfaces Monitoring
  - Oil Analysis
  - One-Time Inspection
  - Periodic Surveillance and Preventive Maintenance
- Non-EQ Insulated Cables and Connections
- Non-EQ Instrumentation Circuits Test Review
- Metal Enclosed Bus Inspection

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 SQN 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 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 SQN 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. SQN is not located near the seacoast or near other sources of airborne particles. Therefore, reduced insulation resistance due to surface contamination is not an applicable aging effect for high-voltage insulators at SQN.

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.

There are no aging effects requiring management for SQN 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 SQN, transmission conductors from the SQN 161-kV switchyard to the CSST A and from the SQN 161-kV switchyard to the CSST B 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 SQN, switchyard bus from the 161-kV switchyard breakers to the 161-kV transmission conductors supports 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 Conductor Strength (Corrosion)

This aging effect 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.

The SQN transmission conductors subject to aging management review are all aluminum conductor (AAC) construction, so the typical degradation of ACSR conductors is not applicable to SQN.

SQN CSST A and B transformer high-voltage side are connected to the 161-kV switchyard via overhead transmission lines. These 161-kV overhead transmission conductors are 636 thousand circular mils (MCM) AAC (Orchid 37) conductors.

SQN AAC transmission conductors are stranded aluminum conductor consisting of alloy wires in a multi-layer construction. AAC transmission conductors are similar in construction to aluminum-reinforced designed aluminum conductor aluminum reinforced (ACAR) transmission conductors except that the AAC transmission conductors do not have an aluminum alloy core. The aluminum-reinforced design gives ACAR transmission conductors a higher strength rating; however, this is not needed for the short span of the 161-kV AAC transmission conductors. AAC transmission conductors, like the ACAR transmission conductors, have better corrosion resistant properties, so they are not susceptible to environmental influences, such as SO_2 concentration in the air. When aluminum corrodes, it forms a protective oxide layer that protects the underlying material from further corrosion, unlike the steel core of an ACSR conductor which gradually loses its galvanized coating and will continually corrode, causing a decrease in ultimate strength. Therefore, the SQN AAC transmission conductors are not susceptible to the same corrosion phenomenon as ACSR transmission conductors.

For the aging management review of ACSR transmission conductors, the Ontario Hydroelectric study is used to discuss the environment and aging effects. ACAR and AAC transmission conductors are not susceptible to the same corrosion phenomenon as ACSR transmission conductors, and this study supports that statement. The

Ontario Hydroelectric test did not include 636 MCM AAC conductors. The Ontario Hydroelectric study reported,

> The aluminum layers were found to have retained their original properties to a large degree. On the other hand the steel strands showed reductions in both tensile strength and the number of turns to failure.

This is consistent with NUREG-1801 Item VI.A.LP-46 that states a program for ACAR transmission cables is not needed for loss of conductor strength due to corrosion, and no further evaluation is needed. The AAC transmission conductors have the same corrosion resistant properties as the ACAR transmission conductors.

The SQN transmission conductors within the scope of this review are relatively short spans. Therefore, the tension exerted on the conductors in the 161-kV Switchyard is less than would be experienced in typical transmission applications, which could be up to 1000 feet in length. The AAC transmission conductors do not have a loss of conductor strength due to corrosion, so there is reasonable assurance that the SQN AAC transmission conductors will have ample conductor strength through the period of extended operation.

A review of industry OE 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 OE did not identify any unique aging effects for transmission conductors.

Therefore, loss of conductor strength is not an aging effect requiring management for AAC transmission conductors.

Loss of Material (Wear)

Wind loading can 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 SQN. 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.

Operation of active switchyard components is also a potential contributor to vibration and resulting wear. Switchyard bus is connected to active equipment by short sections of flexible conductors, so 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. The flexible conductors are part of the switchyard bus commodity group. Vibration is not applicable for switchyard bus since flexible conductors connecting switchyard bus to active components eliminate potential for vibration.

A review of industry OE 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 OE did not identify any unique aging effects for transmission conductors.

There are no applicable aging effects requiring management for SQN switchyard bus.

Therefore, loss of material resulting from wear of transmission conductors is not an aging effect requiring management at SQN.

Therefore, loss of material due to wear of switchyard bus is not an aging effect requiring management at SQN.

Increased Connection Resistance (Corrosion)

Corrosion due to surface oxidation for welded aluminum switchyard bus and connections is not applicable. However, the flexible conductors, which are welded to the switchyard bus, are bolted to the other switchyard components. These steel and steel alloy switchyard bus component connections are included in the following discussions with the transmission bolted connection components.

Increased connection resistance due to surface oxidation is a potential aging effect, but it is not significant enough to cause a loss of intended function. The aluminum, steel, 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 impact the ability of the connections to perform their intended function. At SQN, 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 minimizing the potential for corrosion. Based on operating experience (SQN and the industry), this method of installation provides a corrosion-resistant low electrical resistance connection. In addition, the infrared inspection of the 161-kV yard verifies that this aging effect is not significant for SQN. This discussion is applicable for bolted connections of transmission conductors and switchyard bus.

These switchyard component connections are included in the infrared inspection of the 161-kV switchyard and transformer yard connections, which verifies the effectiveness of the connection design and installation practices. SQN performs infrared inspections of the 161-kV switchyard connections and transformer yard connections as part of a Level I repetitive preventive maintenance (PM) task to verify the integrity of the connections at least once a year. This inspection and the absence of plant specific OE verifies that this aging effect is not significant for SQN.

Therefore, increased connection resistance due to general corrosion resulting from oxidation of switchyard connection metal surfaces is not an aging effect requiring management at SQN.

Increased Connection Resistance (Loss of Preload)

Increased connection resistance due to loss of pre-load (torque relaxation) for switchyard connections is not an aging effect requiring management. The EPRI license renewal electrical handbook (LREH) does not list loss of pre-load as an applicable aging mechanism. The design of the transmission conductor and switchyard bus bolted connections precludes torque relaxation as confirmed by plant specific OE. The SQN OE report did not identify any failures of switchyard connections. The design of switchyard bolted connections includes Bellville washers and an anti-oxidant compound (i.e., a grease-type sealant) to preclude connection degradation. The type of bolting plate and the use of Bellville washers is the industry standard to preclude torque relaxation. Combined with the proper sizing of the conductors, this eliminates the need to consider this aging mechanism; therefore, increased connection resistance due to loss of pre-load on switchyard connections 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 SQN are limited to the connections from the 161-kV switchyard to CSST A and B for the off-site power recovery paths. SQN performs infrared inspection of the 161-kV switchyard connections as part of a repetitive PM task to verify the integrity of the connections. These routine Level I inspections and the absence of plant-specific OE verifies that this aging effect is not significant for SQN.

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 SQN.

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 SQN 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 SQN quality assurance procedures and administrative controls for aging management 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 Electrical and I&C Components Evaluated in Chapter VI of NUREG-1801

Table 3.6.1: Electrical 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.

Table 3.6.1: Electrical 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 SQN. 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 SQN. 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	Consistent with NUREG-1801. An AMP is not required to manage loss of conductor strength due to corrosion for AAC transmission conductors. See Section 3.6.2.2.3 for further evaluation.

Table 3.6.1: Electrical Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 SQN. See Section 3.6.2.2.3 for further evaluation.
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 SQN. 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 SQN. See Section 3.6.2.2.3 for further evaluation.

Table 3.6.1: Electrical Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. SQN EQ electrical and I&C penetration assemblies are covered under the EQ program.

Table 3.6.1: Electrical 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 Instrumentation Circuits Test Review Program will manage the effects of aging. This program includes review of calibration results or surveillance findings for instrumentation circuits.

Table 3.6.1: Electrical Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 to 35 kV) Program will manage the effects of aging. Includes inspection and testing of power cables exposed to significant moisture as required. In Table 3.6.2, separate lines are used for cables with voltages 400 V to 35 kV and for 161 kV.
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. The flexible boots will be visually inspected and manually flexed to manage change in material properties.

Table 3.6.1: Electrical Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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.

Table 3.6.1: Electrical Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 SQN. A review of SQN documents indicated that fuse holders utilizing metallic clamps located in circuits that perform an intended function, and are not part of an active device, do not have aging effects that require management. Therefore, fuse holders with metallic clamps at SQN do not have aging effects that require an aging management program.

Table 3.6.1: Electrical 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 SQN. A review of SQN documents indicated that fuse holders utilizing metallic clamps located in circuits that perform an intended function, and are not part of an active device, do not have aging effects that require management. Therefore, fuse holders with metallic clamps at SQN 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 Cable Connections Program) will verify the absence of aging effects requiring management.

Table 3.6.1: Electrical 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)	None	NUREG-1801 material and aging effects are not applicable to SQN.

Table 3.6.1: Electrical Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-21	Fuse holders (not part of active equipment): insulation material, metal enclosed bus: external surface of enclosure assemblies composed of insulation material: bakelite; phenolic melamine or ceramic; molded polycarbonate; other, galvanized steel; aluminum, steel exposed to air – indoor, controlled or uncontrolled	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Notes for Table 3.6.2

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

601. Based on the aging management review, these fuse holders do not have aging effects that require an aging management program.

602. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

Table 3.6.2
Electrical Components
Summary of Aging Management

Table 3.6.2: Electrical Components								
Component Type	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**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 Cable Connections	VI.A.LP-30	3.6.1-18	A
Insulation material for electrical cables and connections (including terminal blocks, fuse holders, etc.) not subject to 10 CFR 50.49 EQ requirements (includes non-EQ electrical and I&C penetration conductors and connections)	CE	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	3.6.1-8	A

Table 3.6.2: Electrical Components								
Component Type	**Component Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Insulation material for electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	CE	Insulation material – various organic polymers	Heat, moisture, or radiation and air	Reduced insulation resistance (IR)	Non-EQ Instrumentation Circuits Test Review	VI.A.LP-34	3.6.1-9	A
Fuse holders (not part of active equipment): insulation material	CE	Insulation material – various organic polymers	Air – indoor controlled or uncontrolled	None	None	VI.A.LP-24	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	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	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	3.6.1-2	I

Table 3.6.2: Electrical Components

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
High voltage insulators (high voltage insulators for SBO recovery)	IN	Porcelain, galvanized metal, cement	Air – outdoor	None	None	VI.A.LP-28	3.6.1-3	I
Conductor insulation for inaccessible power cables (400 V to 35 kV) not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material – various organic polymers	Significant moisture	Reduced insulation resistance (IR)	Non-EQ Inaccessible Power Cables (400 V to 35 kV)	VI.A.LP-35	3.6.1-10	A
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	3.6.1-15	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

Table 3.6.2: Electrical Components

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Metal enclosed bus: external surface of enclosure assemblies	CE	Steel	Air – indoor, controlled	None	None	VI.A.LP-44	3.6.1-14	A
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
161-kV oil-filled cable	CE	Insulation material – various organic polymers	Air – outdoor	None	None	VI.A.LP-35	3.6.1-10	J
161-kV oil-filled cable	IN	Insulation material – oil	Insulating oil (internal)	Reduced insulation resistance	Oil Analysis Periodic Surveillance and Preventive Maintenance	VI.A.LP-35	3.6.1-10	J, 602
161-kV oil-filled cable: reservoir tanks	IN	Carbon steel	Insulating oil (internal)	Loss of material	Oil Analysis One-Time Inspection	VII.CI.AP-127	3.3.1-97	C, 602

Table 3.6.2: Electrical Components

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
161-kV oil-filled cable: reservoir tanks	IN	Carbon steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	C
161-kV oil-filled cable: tubing, valves, instruments	IN	Stainless steel	Insulating oil (internal)	Loss of material	Oil Analysis One-Time Inspection	VII.C1.AP-138	3.3.1-100	C, 602
161-kV oil-filled cable: tubing, valves, instruments	IN	Copper alloy	Insulating oil (internal)	Loss of material	Oil Analysis One-Time Inspection	VII.C1.AP-133	3.3.1-99	C, 602
161-kV oil-filled cable: tubing, valves, instruments	IN	Stainless steel	Air – outdoor (external)	Loss of material	External Surfaces Monitoring	VII.C1.AP-221	3.3.1-6	C
161-kV oil-filled cable: tubing, valves, instruments	IN	Stainless steel	Air – outdoor (external)	Cracking	External Surfaces Monitoring	VII.C1.AP-209	3.3.1-4	C
161-kV oil-filled cable: tubing, valves, instruments	IN	Copper alloy	Air – outdoor (external)	Loss of material	External Surfaces Monitoring	VII.I.AP-159	3.3.1-81	C
Switchyard bus and connections (switchyard bus for SBO recovery)	CE	Aluminum, steel, steel alloy	Air – outdoor	None	None	VI.A.LP-39	3.6.1-6	I

Table 3.6.2: Electrical Components

Component Type	Component Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Transmission conductors (transmission conductors for SBO recovery)	CE	Aluminum	Air – outdoor	None	None	VI.A.LP-46	3.6.1-4	C
Transmission conductors (transmission conductors for SBO recovery)	CE	Aluminum	Air – outdoor	None	None	VI.A.LP-47	3.6.1-7	I
Transmission connectors (transmission connectors for SBO recovery)	CE	Aluminum, steel, steel alloy	Air – outdoor	None	None	VI.A.LP-48	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	3.6.1-19	A

4.0 TIME-LIMITED AGING ANALYSES

This section provides the results of reviews of potential time-limited aging analyses (TLAAs) and exemptions based on a TLAA and documents evaluations of each identified item. This section evaluates each identified TLAA in accordance with 10 CFR 54.21(c).

Section 4.1 provides the 10 CFR 54 definition 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 [current licensing basis] 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.

- Updated Final Safety Analysis Report (UFSAR)
- Technical Specifications and Bases
- Technical Requirements Manual
- Facility Operating Licenses
- Fire protection documents
- Inservice Inspection Program documents
- 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 plant-specific list. 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 SQN. Table 4.1-2 provides a comparison of the SQN TLAAs to the potential TLAAs identified in NUREG-1800.

4.1.2 Identification of Exemptions

Exemptions for SQN were identified through a review of the UFSAR, the operating licenses, the Technical Specifications, the NRC SERs, ASME Section XI Program documentation, fire protection documents, NRC Agencywide Documents Access and Management System (ADAMS) database, and docketed correspondence. No exemptions that will remain in effect for the period of extended operation are based on a TLAA.

Table 4.1-1
List of TLAAs

TLAA Description	Resolution Option	LRA Section
Reactor Vessel Neutron Embrittlement Analyses		
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) power-operated relief valve (PORV) setpoints	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.2.5
Metal Fatigue		
Reactor vessels	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
Pressurizers	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 rod 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 piping built to B31.1	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.3.1.7
Reactor coolant system piping with fatigue analysis	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.1.7
Non-class 1 piping and components using stress range reduction factors	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.3.2.1

Table 4.1-1 (Continued)
List of TLAAs

TLAA Description	Resolution Option	LRA Section
Non-Class 1 piping with fatigue analysis	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.3.2.2
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	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.4
Concrete Containment Tendon Prestress	None. SQN containment does not include tendons.	4.5
Containment Liner Plate, Metal Containment, and Penetrations Fatigue Analyses	Analysis that is a TLAA remains valid 10 CFR 54.21(c)(1)(i)	4.6
Other Plant-Specific TLAAs		
Underclad cracking analysis	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.7.1
Crane load cycle analysis	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.2
Leak-before-break analysis	Analysis remains valid 10 CFR 54.21(c)(1)(i)	4.7.3

Table 4.1-2
Comparison of SQN TLAAs to NUREG-1800 TLAAs

NUREG-1800 TLAA Description	Applicable to SQN (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. SQN containment design does not include tendons.	4.5
Inservice local metal containment corrosion analyses	No. SQN has no corrosion TLAA.	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.	Yes	4.7.1
Low-temperature overpressure protection analyses	Yes	4.2.5
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pumps	Yes	4.3.2
Fatigue analysis of the reactor coolant pump flywheel	No. Current licensing basis analysis is for 60 years.	NA
Fatigue analysis of polar crane	No. Polar crane not built to CMAA-70.	4.7.2
Flow-induced vibration endurance limit for the reactor vessel internals	No. Evaluations are not based on the current operating term of 40 years and are therefore not TLAAs.	4.3.1.2
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	No. No TLAA exists for SQN.	NA
Leak before break	Yes	4.7.3

Table 4.1-2 (Continued)
Comparison of SQN TLAAs to NUREG-1800 TLAAs

NUREG-1800 TLAA Description	Applicable to SQN (Yes/No)	LRA Section
Fatigue analysis for the containment liner plate	No. Containment liner plate fatigue analysis was not performed for SQN.	NA
Containment penetration pressurization cycles	No. No specific fatigue analyses for SQN.	NA
Metal corrosion allowance	No. Corrosion allowances for metallic components were reviewed and no TLAAs were identified.	NA
High-energy line-break postulation based on fatigue cumulative factor	No. SQN did not use cumulative usage factor (CUF) criteria to exclude break locations.	NA
Inservice flaw growth analyses that demonstrate structure stability for 40 years	No. No SQN analyses meet TLAA definition.	NA

4.2 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 (Ref. 4-6, 4-7).

The operating license for SQN Unit 1 expires on September 17, 2020, and for SQN Unit 2 on September 15, 2021. With renewed licenses, the licenses would expire on September 17, 2040, for SQN Unit 1 and on September 15, 2041, for SQN Unit 2. As of October 2, 2010, SQN Unit 1 had accumulated approximately 21 EFPY of operation. As of May 23, 2011, SQN Unit 2 had accumulated 21.6 EFPY. Assuming the plants are operated at a capacity factor of 97 percent from the dates above 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.

<u>SQN Unit 1</u>
21 + 0.97(29.9 years of operation remaining after October 2, 2010) = 50 EFPY

<u>SQN Unit 2</u>
21.6 + 0.97(30.3 years of operation remaining after May 23, 2011) = 51 EFPY

Therefore, 52 EFPY will be used to bound the expected EFPY for both units.

4.2.1 <u>Reactor Vessel Fluence</u>

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 SQN Unit 1 and SQN Unit 2 reactor pressure vessel beltline material have been projected to 52 EFPY of operation.

The methods used to calculate the SQN Unit 1 and Unit 2 vessel fluence satisfy the criteria set forth in Regulatory Guide (RG) 1.190 (Ref. 4-9). 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. 4-17, 4-11)

UFSAR Section 5.4.3.7 provides additional information on the specimen capsules and the associated dosimeters used to monitor reactor vessel embrittlement and neutron fluence. SQN is providing under separate submittal information on surveillance capsule relocation and removal schedule for NRC review. See LRA Section B.1.35 for additional information on the Reactor Vessel Surveillance Program.

Figure 4.2-1 identifies the vessel weld and forging names used in this section. The original beltline was defined for SQN as lower shell forging 04, intermediate shell forging 05, and intermediate shell to lower shell circumferential weld 05. The vessel wall welds and plates were evaluated to determine fluence values at the end of the period of extended operation. Components with fluence values greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) at 52 EFPY are considered part of the extended beltline. The extended beltline includes the upper shell to intermediate shell circumferential weld W06, upper shell forging 06, lower shell to bottom head ring circumferential weld W04, and bottom head ring 03. All other locations, including the inlet and outlet nozzles, were determined to be below the 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) threshold. Locations with fluence values that are greater than 1.0 x 10^{17} n/cm^2 (E > 1.0 MeV) are shown in Tables 4.2-1 and 4.2-2.

Contrary to the definition of TLAA 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).

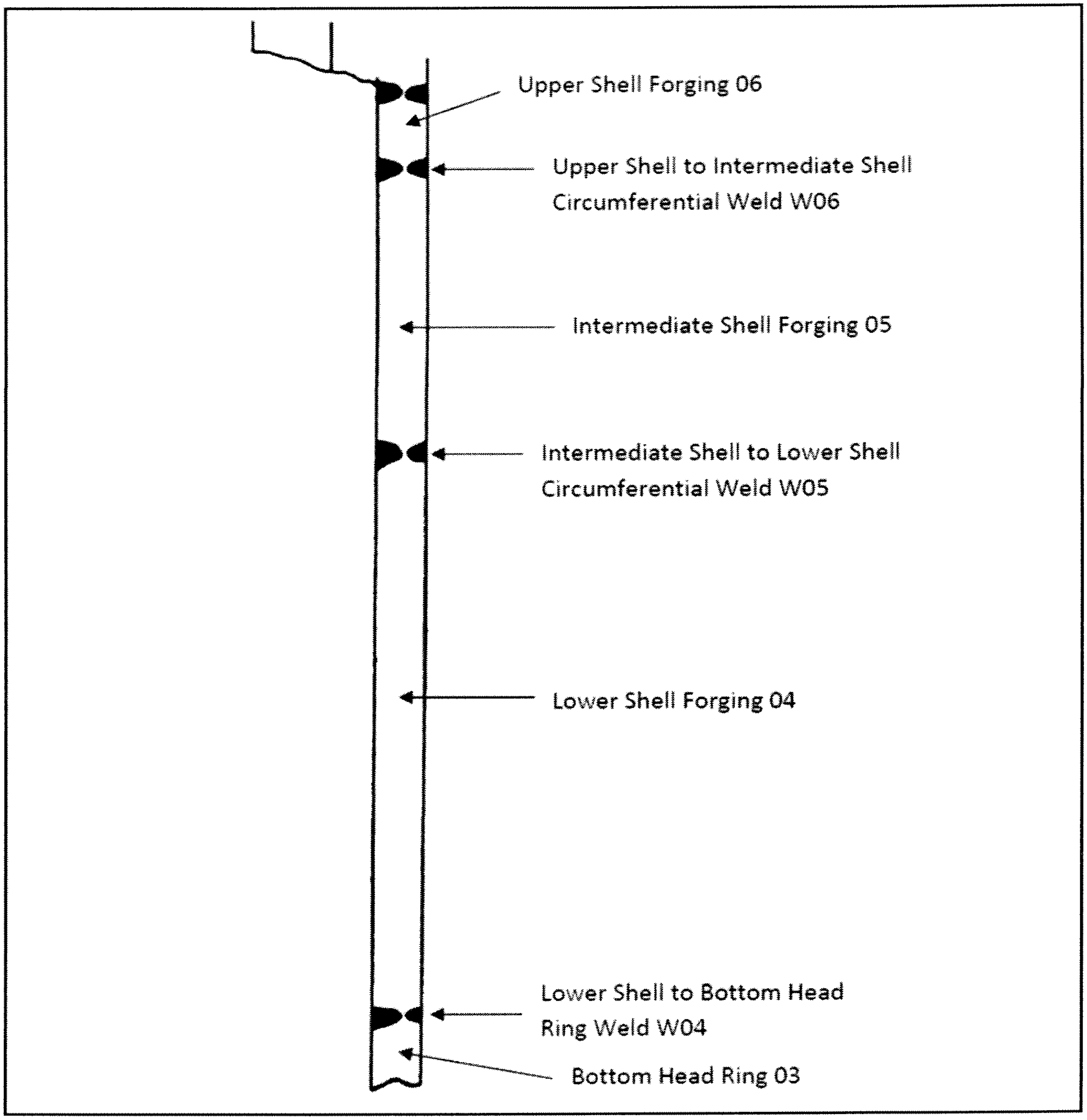

Figure 4.2-1
Reactor Vessel Material Identification for Units 1 and 2

Table 4.2-1
Projected Neutron Fluence for the Unit 1 Vessel at 52 EFPY (x 10^{19} n/cm^2, E > 1.0 MeV)

Location	Intermediate Shell Forging 05(1)	Intermediate Shell to Lower Shell Circ.(3) Weld W05(1)	Lower Shell Forging 04(1)	Upper Shell to Intermediate Shell Circ. Weld W06(2)	Upper Shell Forging 06(2)	Lower Shell to Bottom Head Ring Circ. Weld W04(2)	Bottom Head Ring 03(2)
¼ thickness	1.602	1.596	1.602	0.035	0.035	0.202	0.202
Clad/base interface	2.66	2.65	2.66	0.0584	0.0584	0.336	0.336

1. Included as part of the original beltline.
2. Included as part of the extended beltline.
3. Circumferential

Table 4.2-2
Projected Neutron Fluence for the Unit 2 Vessel at 52 EFPY (x 10^{19} n/cm^2, E > 1.0 MeV)

Location	Intermediate Shell Forging 05(1)	Intermediate Shell to Lower Shell Circ. Weld W05(1)	Lower Shell Forging 04(1)	Upper Shell to Intermediate Shell Circ. Weld W06(2)	Upper Shell Forging 06(2)	Lower Shell to Bottom Head Ring Circ. Weld W04(2)	Bottom Head Ring 03(2)
¼ thickness	1.548	1.536	1.548	0.033	0.033	0.190	0.190
Clad/base interface	2.57	2.55	2.57	0.0552	0.0552	0.316	0.316

1. Included as part of the original beltline.
2. Included as part of the extended beltline.

4.2.2 Upper-Shelf Energy

Upper shelf energy (USE) was evaluated for all materials included in the original and extended 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 52 EFPY USE values for the beltline materials were determined using methods consistent with RG 1.99 (Ref. 4-8). 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 52 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 SQN Units 1 and 2 beltline and extended beltline materials remain above the 50 ft-lb limit at 52 EFPY. The results are summarized in Tables 4.2-3 and 4.2-4. For SQN Unit 1 (see Table 4.2-3), the limiting USE value at 52 EFPY is 52.5 ft-lb for bottom head ring 03. For SQN Unit 2 (see Table 4.2-4), the limiting USE value at 52 EFPY is 53.1 ft-lb for bottom head ring 03.

All of the original beltline and extended beltline materials in the SQN Units 1 and 2 reactor vessels are projected to remain above the USE limit of 50 ft-lb (per 10 CFR 50 Appendix G) through 52 EFPY. Therefore, the SQN Units 1 and 2 reactor vessel Charpy USE TLAAs have 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
Predicted USE Values at 52 EFPY for Unit 1

Reactor Vessel Material	Cu (Wt. %)	52 EFPY ¼T Fluence(1) (x 10^{19} n/cm^2)	Initial USE (ft-lb)	Projected USE Decrease(2)(%)	52 EFPY USE (ft-lb)
Reactor Vessel Beltline Materials					
Intermediate shell forging 05	0.15	1.602	79	27	57.7
Lower shell forging 04	0.13	1.602	72	25	54.0
Using surveillance data	0.13	1.602	72	26(3)	53.3
Intermediate shell to lower shell circ. weld W05 (Heat # 25295)	0.35	1.596	113	46	61.0
Using surveillance data	0.35	1.596	113	46(3)	61.0
Reactor Vessel Extended Beltline Materials					
Upper shell forging 06	0.16	0.035	83	12	73.0
Bottom head ring 03	0.16	0.202	64	18	52.5
Upper shell to intermediate shell circ. weld W06 (Heat # 25006)	0.17	0.035	78	15	66.3
Lower shell to bottom head ring weld W04 (Heat # 25295)	0.35	0.202	113	34	74.6
Using surveillance data	0.35	0.202	113	29(3)	80.2

1. The ¼T fluence was calculated using the RG 1.99, Revision 2, correlation and the SQN Unit 1 reactor vessel beltline wall thickness of 8.45 inches.
2. Unless otherwise noted, percentage USE decrease values are based on Position 1.2 of RG 1.99, Revision 2, and were calculated by plotting the ¼T fluence values on Figure 2 of the regulatory guide. The percent USE decrease values that corresponded to each material's specific Cu wt. % value were determined using interpolation between the existing weld or base metal lines.

3. Percentage USE decrease is based on Position 2.2 of RG 1.99, Revision 2. 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 the increase in reference temperature for nil-ductility transition (ΔRT_{NDT}), "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." RG 1.99, Revision 2, Position 2.2 indicates that an upper-bound line drawn parallel to the existing lines (in Figure 2 of the Guide) should be used in preference to the existing graph lines for determining the decrease in USE.

Table 4.2-4
Predicted USE Values at 52 EFPY for Unit 2

Reactor Vessel Material	Cu (Wt. %)	52 EFPY ¼T Fluence(1) (x 10^{19} n/cm^2)	Initial USE (ft-lb)	Projected USE Decrease(2)(%)	52 EFPY USE (ft-lb)
Reactor Vessel Beltline Materials					
Intermediate shell forging 05	0.13	1.548	93	25	69.8
Using surveillance data	0.13	1.548	93	21(3)	73.5
Lower shell forging 04	0.14	1.548	100	26	74.0
Intermediate shell to lower shell circ. weld W05 (Heat # 4278)	0.12	1.536	102	29	72.4
Using surveillance data	0.12	1.536	102	38(3)	63.2
Reactor Vessel Extended Beltline Materials					
Upper shell forging 06	0.16	0.033	68	12	59.8
Bottom head ring 03	0.16	0.190	64	17	53.1
Upper shell to intermediate shell circ. weld W06 (Heat # 721858)	0.08	0.033	78	10	70.2
Lower shell to bottom head ring weld W04 (Heat # 721858)	0.08	0.190	78	15	66.3

1. The ¼T fluence was calculated using the RG 1.99, Revision 2, correlation and the SQN Unit 2 reactor vessel beltline wall thickness of 8.45 inches.
2. Unless otherwise noted, percentage USE decrease values are based on Position 1.2 of RG 1.99, Revision 2, and were calculated by plotting the ¼T fluence values on Figure 2 of the regulatory guide. The percent USE decrease values that corresponded to each material's specific Cu wt. % value were determined using interpolation between the existing weld or base metal lines.

3. Percentage USE decrease is based on Position 2.2 of RG 1.99, Revision 2. 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}, "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." RG 1.99, Revision 2, Position 2.2 indicates that an upper-bound line drawn parallel to the existing lines (in Figure 2 of the Guide) should be used in preference to the existing graph lines for determining the decrease in USE.

4.2.3 <u>Pressurized Thermal Shock</u>

10 CFR 50.61(b)(1) 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(b)(2) establishes screening criteria for RT_{PTS} at 270°F for plates, forgings, and axial welds and 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 (Ref. 4-8). 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 SQN Unit 1 limiting RT_{PTS} value for forging materials at 52 EFPY is 227.9°F (see Table 4.2-5), which applies to lower shell forging 04 using credible surveillance data. The limiting RT_{PTS} value for the Unit 1 circumferentially oriented welds at 52 EFPY is 163.6°F (see Table 4.2-5), which applies to intermediate shell to lower shell circumferential weld W05 using credible surveillance data.

The SQN Unit 2 limiting RT_{PTS} value for forging materials at 52 EFPY is 142.3°F (see Table 4.2-6), which applies to lower shell forging 04. The limiting RT_{PTS} value for the Unit 2 circumferentially oriented welds at 52 EFPY is 150.7°F (see Table 4.2-6), which applies to intermediate shell to lower shell circumferential weld W05 using non-credible surveillance data.

The beltline and extended beltline materials in the Unit 1 and Unit 2 reactor vessels are below the RT_{PTS} screening criteria values of 270°F for forgings and 300°F for circumferentially oriented welds through 52 EFPY. Therefore, the Sequoyah Unit 1 and Unit 2 reactor vessel RT_{PTS} TLAAs have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-5
Calculation of Unit 1 RT_{PTS} Values for 52 EFPY

Reactor Vessel Material	CF (°F)	52 EFPY Fluence (x 10^{19} n/cm^2)	FF(1)	$RT_{NDT(U)}$(2) (°F)	ΔRT_{NDT}(3) (°F)	σ_U(2) (°F)	σ_Δ(4) (°F)	Margin (°F)	RT_{PTS} (°F)
Reactor Vessel Beltline Materials									
Intermediate shell forging 05	115.6	2.66	1.2616	40	145.8	0	17.0	34.0	219.8
Lower shell forging 04	95.0	2.66	1.2616	73	119.8	0	17.0	34.0	226.8
Using credible surveillance data	109.3	2.66	1.2616	73	137.9	0	8.5	17.0	227.9
Intermediate shell to lower shell circ. weld W05 (Heat # 25295)	161.3	2.65	1.2607	-40	203.3	0	28.0	56.0	219.3
Using credible surveillance data	139.3	2.65	1.2607	-40	175.6	0	14.0	28.0	163.6
Reactor Vessel Extended Beltline Materials									
Upper shell forging 06	123.9	0.0584	0.3180	23	39.4	0	17.0	34.0	96.4
Bottom head ring 03	122.3	0.336	0.6997	5	85.6	0	17.0	34.0	124.6
Upper shell to intermediate shell circ. weld W06 (Heat # 25006)	207.0	0.0584	0.3180	10	65.8	0	28.0	56.0	131.8
Lower shell to bottom head ring weld W04 (Heat # 25295)	161.3	0.336	0.6997	-40	112.9	0	28.0	56.0	128.9
Using credible surveillance data	139.3	0.336	0.6997	-40	97.5	0	14.0	28.0	85.5

1. FF = fluence factor = $f^{(0.28-0.10*\log(f))}$.
2. Initial RT_{NDT} values are based on measured data for all of the materials. Note that σ_U = 0°F for measured values.
3. ΔRT_{NDT} = CF * FF where CF = chemistry factor.
4. Per 10 CFR 50.61, the base metal σ_Δ = 17°F for Position 1.1 and σ_Δ = 8.5°F for Position 2.1 with credible surveillance data; the weld metal σ_Δ = 28°F for Position 1.1 and σ_Δ = 14°F for Position 2.1 with credible surveillance data. However, σ_Δ need not exceed 0.5 * ΔRT_{NDT}.

Table 4.2-6
Calculation of Unit 2 RT_{PTS} Values for 52 EFPY

Reactor Vessel Material	CF (^oF)	52 EFPY Fluence (x 10^{19} n/cm^2)	FF[1]	$RT_{NDT(U)}$[2] (^oF)	ΔRT_{NDT}[3] (^oF)	σ_U[2] (^oF)	σ_Δ[4] (^oF)	Margin (^oF)	RT_{PTS} (^oF)
Reactor Vessel Beltline Materials									
Intermediate shell forging 05	95.0	2.57	1.2531	10	119.0	0	17.0	34.0	163.0
Using credible surveillance data	91.1	2.57	1.2531	10	114.2	0	8.5	17.0	141.2
Lower shell forging 04	104.0	2.57	1.2531	-22	130.3	0	17.0	34.0	142.3
Intermediate shell to lower shell circ. weld W05 (Heat # 4278)	63.0	2.55	1.2511	-4	78.8	0	28.0	56.0	130.8
Using non-credible surveillance data	78.9	2.55	1.2511	-4	98.7	0	28.0	56.0	150.7
Reactor Vessel Extended Beltline Materials									
Upper shell forging 06	123.4	0.0552	0.3087	5	38.1	0	17.0	34.0	77.1
Bottom head ring 03	122.3	0.316	0.6837	5	83.6	0	17.0	34.0	122.6
Upper shell to intermediate shell circ. weld W06 (Heat # 721858)	108.0	0.0552	0.3087	10	33.3	0	16.7	33.3	76.7
Lower shell to bottom head ring weld W04 (Heat # 721858)	108.0	0.316	0.6837	10	73.8	0	28.0	56.0	139.8

1. FF = fluence factor = $f^{(0.28-0.10*\log(f))}$.
2. Initial RT_{NDT} values are based on measured data for all of the materials. Note that σ_U = 0°F for measured values.
3. ΔRT_{NDT} = CF * FF where CF = chemistry factor.
4. Per 10 CFR 50.61, the base metal σ_Δ = 17°F for Position 1.1 and σ_Δ = 8.5°F for Position 2.1 with credible surveillance data; the weld metal σ_Δ = 28°F for Position 1.1 and for Position 2.1 with non-credible surveillance data. However, σ_Δ need not exceed 0.5 * ΔRT_{NDT}.

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 materials and fluence data obtained through the Reactor Vessel Surveillance Program. 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.

SQN Unit 1 Technical Specification 3.4.9.1 and the SQN Unit 2 Technical Specification 3.4.9.1 require the RCS pressure, RCS temperature, and RCS heatup and cooldown rates to be maintained within the limits specified in the P-T limits report (PTLR). The Technical Specifications Administrative Controls Section 6.9.1.15 provides additional details on the PTLR and the Westinghouse topical reports that provide the analytical methods used to determine the RCS P-T limits. It requires the analytical methods used to determine the RCS P-T limits to be those previously reviewed and approved by the NRC and requires the PTLR to be provided to the NRC within 30 days of issuance of any revision or supplement thereto. (Ref. 4-5)

The analyses used to determine the P-T limit curves, including the associated WCAP supporting documentation, are considered TLAAs. The SQN Unit 1 and Unit 2 P-T limit curves contained in each plant's PTLR provide the limits through 32 EFPY. Prior to exceeding 32 EFPY, SQN will generate new PTLRs to cover plant operation beyond 32 EFPY. As required by Technical Specification 6.9.1.15, the P-T limit curves will be developed using NRC-approved analytical methods. (Ref. 4-5)

The SQN Unit 1 and Unit 2 P-T limit curves in each plant's PTLR will be updated, as 10 CFR 50 Appendix G requires, through the period of extended operation in conjunction with the Reactor Vessel Surveillance Program. The analysis of the P-T curves will consider locations outside of the beltline such as nozzles, penetrations and other discontinuities to determine if more restrictive P-T limits are required than would be determined by considering only the reactor vessel beltline materials. Therefore, the 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).

4.2.5 Low Temperature Overpressure Protection (LTOP) PORV Setpoints

The SQN Unit 1 Technical Specification 3.4.12 and SQN Unit 2 Technical Specification 3.4.12 specify that the power operated relief valve (PORV) lift settings must be within the limits of the PTLR (Ref. 4-5). Additional descriptions of the PORV setpoint and the PTLR are provided in the Technical Specification 3/4.4.12 Bases. Each time the P-T limit curves are revised, the LTOP PORV setpoints must be reevaluated. Therefore, low temperature overpressure protection limits are considered part of the calculation of P-T curves in each plant's PTLR. The P-T limit curves are updated prior to exceeding applicable EFPY limits. See Section 4.2.4 for further information on the P-T limit curves. Therefore, the LTOP PORV Setpoints TLAAs will be adequately managed 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 LRA Section 3 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, the associated fatigue analyses are evaluated in this section. Evaluation of the TLAA 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 SQN Class 1 component 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 documented in Section 4.3.3.

4.3.1 Class 1 Fatigue

The major Class 1 components at SQN include the reactor vessels, pressurizers, reactor coolant pumps, steam generators, control rod drives, and all associated piping and valves. The following are systems and associated LRA drawings that include Class 1 components.

System (System Code)	LRA Drawing(s)
Reactor Coolant System (68)	LRA-1,2-47W813-1
Safety Injection System (63)	LRA-1-47W811-1 and LRA-2-47W811-1
Residual Heat Removal System (74)	LRA-1, 2-47W810-1
Chemical & Volume Control System (62)	LRA-1-47W809-1 and LRA-2-47W809-1

Fatigue evaluations performed in the design of SQN 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 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. CUFs for the respective Class 1 components are provided in the following sections.

Design cyclic loadings and thermal conditions for Class 1 components are defined by applicable design specifications and calculations for each component. The design specifications established the set of transients that were specified for design of the components. The applicable sets of transients are identified within each component stress report.

SQN Technical Specification 6.8.4.l (for both Unit 1 and Unit 2) identifies a component cyclic and transient limit program to provide controls to track the UFSAR Section 5.2.1 cyclic and transient occurrences. UFSAR Section 5.2.1 and UFSAR Table 5.2.1-1 summarize the reactor coolant system cyclic or transient limits. In addition, Technical Requirements Manual surveillance requirement 4.4.9.2.2 requires the recording of any occurrence of pressurizer spray operation with a differential temperature greater than 320ºF for evaluation of the cyclic limits.

The cycles listed in LRA Tables 4.3-1 and 4.3-2 include the transients that are required to be tracked for fatigue that are listed in UFSAR Table 5.2.1-1. Tables 4.3-1 and 4.3-2 contain the cycles as of November 1, 2011, the projected and the allowable cycles for Unit 1 and Unit 2, respectively. In addition to the overall reactor coolant system transients listed in UFSAR Table 5.2.1-1, component specific transients are listed in Tables 4.3-1 and 4.3-2 for the chemical and volume control system charging nozzles, safety injection nozzles, and the feedwater thermal sleeves. SQN will manage the effects of aging due to fatigue of these components using the Fatigue Monitoring Program in accordance with 10 CFR 54.21(c)(1)(iii). The SQN Fatigue

Monitoring Program monitors transient cycles that contribute to fatigue usage and is further described in Appendix B, Section B.1.11.

SQN Unit 1 was granted its operating license on September 17, 1980, and began commercial operation on July 1, 1981. SQN Unit 2 was granted its operating license on September 15, 1981, and began commercial operation on June 1, 1982. The operating license for SQN Unit 1 expires on September 17, 2020, and for SQN Unit 2 on September 15, 2021. These operating license dates were used for determining the projected cycle values in Tables 4.3-1 and 4.3-2.

Table 4.3-1
Unit 1 Projected and Analyzed Transient Cycles(1)

Transient Name	Cycles as of Nov. 1, 2011	Nominal Rate per Year(2)	Projected Cycles(3)	Allowable Number of Cycles
Normal Conditions				
RCS heatup	64	2.07	125	200
RCS cooldown	63	2.04	125	200
Pressurizer heatup	49	1.59	96	200
Pressurizer cooldown	48	1.55	96	200
Large step (95%) decrease	15	0.49	30	200
Upset Conditions				
Loss of load without trip	1	0.04	3	80
Loss of AC power	2	0.07	5	40
Loss of flow (in one reactor coolant loop)	1	0.04	3	80
Reactor trip	136	4.39	264	400
Pressurizer auxiliary spray cycles(4)	1.29	0.05	3	10
½ Safe shutdown earthquake	0	0	0	200 reactor vessel 50 replacement steam generators 50 pressurizer
LTOP actuations	0	0	0	10
Test Conditions				
Turbine roll test	2	0.07	5	10
Primary side hydro	1	0.04	3	5
Secondary side hydro	0	0	0	5
Primary side leak test	0	0	0	50
Other Requirements				
CVCS normal charging nozzle temperature transient	91	2.94	177	200
CVCS alternate charging nozzle temperature transient	47	1.52	92	200

Table 4.3-1
Unit 1 Projected and Analyzed Transient Cycles[1]

Transient Name	Cycles as of Nov. 1, 2011	Nominal Rate per Year[2]	Projected Cycles[3]	Allowable Number of Cycles
Safety injections	7	0.23	14	110
AFW addition with automatic flow control	76.47 hr	5 hr/yr[5]	300 hours	964 hours

1. There will be additions and changes to the tracked cycles listed in this table. See enhancement to Fatigue Monitoring Program in LRA Section B.1.11.
2. Unless otherwise identified, the rate is determined by dividing the total number of events as of November 1, 2011, by 31 years with conservative rounding.
3. The projected total is the rate per year times 60 years with conservative rounding and listing the same number for complementary events such as heatups and cooldowns.
4. Partial cycle counting is calculated based on the actual temperature difference when the spray actuation occurred.
5. The AFW addition with automatic flow control cycle logging was initiated when the thermal liners were installed in the FW piping. This date was November 1, 1995, for Loops 1 and 2 and April 1, 1997, for Loops 3 and 4. The length of time these have been installed is ~16 years, so the rate is ~76.47/16 = ~5 hours per year.

Table 4.3-2
Unit 2 Projected and Analyzed Transient Cycles[1]

Transient Name	Cycles as of Nov. 1, 2011	Nominal Rate per Year[2]	Projected Cycles[3]	Allowable Number of Cycles
Normal Conditions				
RCS heatup	49	1.64	99	200
RCS cooldown	48	1.60	99	200
Pressurizer heatup	38	1.27	77	200
Pressurizer cooldown	37	1.24	77	200
Large step (95%) decrease	20	0.67	41	200
Upset Conditions				
Loss of load without trip	0	0	0	80
Loss of AC power	1	0.04	3	40
Loss of flow (in one reactor coolant loop)	4	0.14	9	80
Reactor trip	109	3.64	219	400
Pressurizer auxiliary spray cycles[4]	2.82	0.10	6	10
½ Safe shutdown earthquake	0	0	0	200 reactor vessel 50 replacement steam generators 50 pressurizer
LTOP actuations	0	0	0	10
Test Conditions				
Turbine roll test	1	0.04	3	10
Primary side hydro	0[5]	0	0	5
Secondary side hydro	0[5]	0	0	5
Primary side leak test	0[5]	0	0	50
Other Requirements				
CVCS normal charging nozzle temperature transient	77	2.57	155	200
CVCS alternate charging nozzle temperature transient	37	1.24	75	200

Table 4.3-2
Unit 2 Projected and Analyzed Transient Cycles[1]

Transient Name	Cycles as of Nov. 1, 2011	Nominal Rate per Year[2]	Projected Cycles[3]	Allowable Number of Cycles
Safety injections	12	0.40	24	110
AFW addition with automatic flow control	155.05 hr	9.2 hr/yr[6]	552 hours	964 hours

1. There will be additions and changes to the tracked cycles listed in this table. See enhancement to Fatigue Monitoring Program in LRA Section B.1.11.
2. The rate is determined by dividing the total number of events as of November 1, 2011, by 30 years with conservative rounding.
3. The projected total is the rate per year times 60 years with conservative rounding and listing the same number for complementary events such as heatups and cooldowns.
4. Partial cycle counting is calculated based on the actual temperature difference when the spray actuation occurred.
5. This count is for the replacement steam generators.
6. The AFW addition with automatic flow control logging was initiated when the thermal liners were installed in the FW piping for Unit 2 Loops 2 and 3 in October 1994. This date was approximately 17 years prior to the cycle counting date, so the rate is 155.05/17 = 9.2 hours per year.

4.3.1.1 Reactor Vessels

As described in UFSAR Section 5.4, design and fabrication of the reactor vessels was in accordance with ASME Section III, Class A. Table 4.3-3 lists the cumulative usage factors for the SQN Units 1 and 2 reactor vessels that are based on the design cycles listed in UFSAR Table 5.2.1-1.

SQN 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 in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-3
Cumulative Usage Factors for the Unit 1 and Unit 2 Reactor Vessels

Location	Usage Factor
Inside the vessel wall adjacent to the core	0.005
Vessel wall adjacent to core support pad	0.005
Vessel wall at transitions	0.000
Core support pad	0.000
Inlet nozzle (nozzle-vessel intersection)	0.1121
Inlet nozzle (safe-end region)	0.0009
Outlet nozzle (nozzle-vessel intersection)	0.0446
Outlet nozzle (safe-end region)	0.6318
Flange	0.007
Instrument tube	0.0001
Auxiliary head adapter	0.147
CRD housing (welded to vessel)	0.302
Reactor vessel studs	0.496
Reactor vessel at studs	0.010
Pipe cap at upper head injection location	0.0
Core exit thermocouple nozzle assembly (CETNA) Housing Nut Collar	 0.3028 0.0784 0.0369

4.3.1.2 Reactor Vessel Internals

As indicated by the title of UFSAR Section 3.9.3, the design of SQN Unit 1 and Unit 2 reactor vessel internals was not covered by the ASME code. SQN Unit 1 and Unit 2, therefore, do not have an ASME stress report for the originally supplied reactor vessel internals.

As described in UFSAR Section 3.9.3, flow-induced vibration was evaluated for the reactor vessel internals. The analyses demonstrate that high cycle vibratory stress ranges are sufficiently low that fatigue failure will not occur (component stress ranges remain below the endurance limit). Since stress ranges remain below the endurance limit, the number of these stress range cycles is not limited over any operating term, including the 40-year operating license term. The supporting analyses are not based on time-dependent assumptions defined by the current operating term and are therefore not TLAAs since they do not meet the definition in 10 CFR 54.3(a).

Stress reports were generated for several specific reactor vessel internals locations to support component replacement or reanalysis. Usage factors were calculated for the CRD guide tube pins. Although thermal stresses in the CRD guide tube pins are low, mechanical loading due to flow changes (such as the change associated with starting a reactor coolant pump) were evaluated for low-cycle fatigue. The evaluation of the CRD guide tube pins determined that a total of 800 transients would bound all of the transients that could cause significant loading on the support pin. This total number of transients bounds the operating basis earthquake through the period of extended operation, and the low usage factor shows significant margin is available.

The lower core plate was reanalyzed as part of the measurement uncertainty recapture power uprate. A usage factor of 0.0 was determined based on the 1989 edition of the ASME Section III and Subsection NG.

Table 4.3-4 lists the cumulative usage factors for the reactor vessel internals components.

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).

Table 4.3-4
Cumulative Usage Factors for Reanalyzed Reactor Vessel Internals Components

Location	Usage Factor
CRD guide tube pins	0.12
Lower core plate	0.0

4.3.1.3 Pressurizers

As described in UFSAR Section 5.5.10, the pressurizers are vertical, cylindrical vessels with essentially hemispherical top and bottom heads constructed of carbon steel, with austenitic stainless steel cladding on all surfaces exposed to reactor coolant. The surge line nozzle and electric heaters are installed in the bottom head. The pressurizers were originally analyzed for the reactor coolant system transients identified in UFSAR Table 5.2.1-1. A later addendum included review of additional transients such as the low temperature overpressure protection transient.

The original analysis assumed the surge nozzle configuration would cause mixing of the water in the pressurizer during insurges. Later studies identified that the lower temperature water would enter the pressurizer and stratify. In a joint project with Duke Power, TVA developed an algorithm to use a mass balance approach to predict the flow rate at the bottom head of the pressurizer and calculate the associated fatigue impact. Table 4.3-5 provides the calculated usage for these locations, which is the sum of the usage calculated for all the original transients identified in Table 4.3-1 or 4.3-2 plus the projected additional usage due to stratification during a total of 200 heatups and cooldowns.

Structural weld overlays were installed on the pressurizer surge, spray, and safety and relief nozzles to eliminate concerns with stress corrosion cracking of Alloy 600. Analysis of these locations now includes a postulated flaw growth analysis. This flaw growth analysis is used only to justify the inspection interval and not to justify operating until the end of the current license term. Therefore, this analysis is not a TLAA.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the pressurizers in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-5
Cumulative Usage Factors for the Pressurizer

Location	Unit 1 Usage Factor	Unit 2 Usage Factor
Pressurizer surge nozzle	0.49471	0.36634
Pressurizer heater well penetration weld	0.07110	0.09428
Pressurizer support leg	0.00126	0.00128
Instrument nozzle	0.1665	0.18414
Spray nozzle	0.848	0.848
Safety and relief nozzle	0.148	0.148
Head to shell junction	0.986	0.986
Support lug	0.048	0.048
Pressurizer heater to weld junction	0.004	0.004
Valve support bracket	0.01	0.01

4.3.1.4 Steam Generators

The replacement steam generators for both SQN Unit 1 and Unit 2 were designed to ASME Boiler and Pressure Vessel Code, Section III, Division 1, 1989 Edition with no Addenda. The SQN Unit 1 steam generators were replaced in the spring of 2003, and the SQN Unit 2 steam generators were replaced in the fall of 2012. Design details of the Unit 2 steam generator replacement modification as of October 1, 2012, are reflected in this application. The replacement steam generators were designed for a 40-year life. Therefore, the 40-year life covers a time period beyond the end of the period of extended operation (2040 for Unit 1 and 2041 for Unit 2).

The replacement steam generator analysis included consideration of the design cycles identified in UFSAR Table 5.2.1-1. The number of assumed design cycles for the replacement steam generator structural analysis for the loading and unloading power changes was reduced to 13,900 cycles and for the safe shutdown earthquake was reduced to 50 cycles. The steam generator analysis included several additional transients that were not in the original transient set, such as tube leak tests. These cycle changes and additional transients are being evaluated and will either be added to the cycles tracked in the Fatigue Monitoring Program or justification will be provided for why they are not required to be added. See the enhancement to the Fatigue Monitoring Program in Appendix B, Section B.1.11.

Table 4.3-6 identifies the cumulative usage factors for the replacement steam generators. The primary manway studs are not listed on Table 4.3-6 since they were qualified for many more cycles than are expected through the period of extended operation by testing (not by cumulative usage factor analysis). The steam generator tube plugs and tube stabilizers do not have a specific calculated usage factor but were qualified through the period of extended operation by testing.

The Fatigue Monitoring Program (with enhancements) will manage the effects of aging due to fatigue on the steam generators in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-6
Cumulative Usage Factors for the Replacement Steam Generators

Location	Unit 1 Usage Factor	Unit 2 Usage Factor
Tubesheet	0.404	0.404
Primary head juncture	0.296	0.296
Tube to tubesheet weld	0.4996	0.4996
Secondary shell	0.0195	0.0195
Primary nozzle	0.01654	0.01654
Primary manway	0.00396	0.00396
Feedwater nozzle	0.772	0.772
Steam outlet nozzle	0.0179	0.0252
Secondary manway	0.09518	0.09518
Secondary manway studs	0.26838	0.26838
Secondary handhole	0.08820	0.08820
Secondary handhole studs	0.21562	0.21562
Divider plate	0.211	0.211
Tubes	0.0	0.02
Secondary internals: U bend support tree	0.202	NA(1)
Secondary internals: FW pipe	0.44	0.44
Upper lateral supports	0.0024	0.0024
Lower vessel supports	0.06	0.06

1. A usage factor was not determined for this location on Unit 2.

4.3.1.5 Control Rod Drive Mechanisms

The control rod drive mechanisms are described in UFSAR Section 4.2.3.2.2 and shown in UFSAR Figure 4.2.3-7. The control rod drive design included consideration of the design transient cycles identified in UFSAR Table 5.2.1-1. Table 4.3-7 lists the cumulative usage factors for the control rod drive mechanisms.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the control rod drive mechanisms in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-7
Cumulative Usage Factors for the Control Rod Drive Mechanisms

Location	Usage Factor
Upper joint: canopy	0.858
Upper joint: weld canopy	0.5045
Upper joint: threaded area	0.36025
Middle joint: weld canopy	0.5235
Lower joint: weld canopy	0.02422

4.3.1.6 Reactor Coolant Pumps

As described in UFSAR Section 5.2, the reactor coolant pumps are vertical, single stage, centrifugal, shaft seal pumps. The reactor coolant pump configuration is shown in UFSAR Figure 5.5.1-1.

The reactor coolant pump design included consideration of the design cycles identified in UFSAR Table 5.2.1-1. Table 4.3-8 identifies the cumulative usage factors for the reactor coolant pumps.

Hydraulic tensioning nuts and studs have been installed on one reactor coolant pump and may be installed in other pumps (if the pumps are disassembled) in place of the original main flange bolts. The hydraulic tensioning analysis included consideration of the design cycles listed in UFSAR Table 5.2.1-1 and also a component specific evaluation of 15 tensioning cycles. Based on plant operational history, the 15 cycles are adequate for the period of extended operation and do not require periodic logging since reactor coolant pump disassembly is infrequent.

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).

Table 4.3-8
Cumulative Usage Factors for the Reactor Coolant Pumps

Location	Usage Factor (Unit 1 and Unit 2)
Casing	0.364
Main flange	0.105
Thermowell	negligible
Main flange bolts	0.67
Hydraulic tensioning studs	0.98(1)
Hydraulic tensioning nuts	0.774(1)
Thermal barrier flange	0.0002
Water connections	0.003
Pressure tap	negligible

1. For a pump that uses hydraulic tensioning fasteners.

4.3.1.7 Reactor Coolant System Piping

As shown in UFSAR Table 3.2.2-2 and discussed in UFSAR Section 5.5.3, the original design analyses for the reactor coolant system piping was in accordance with United States of America Standard (USAS) B31.1. This piping was not analyzed for specific design transients. The USAS B31.1 fatigue design is based on an implicit treatment of cyclic loadings, through a stress range reduction factor applied to the stress allowables that depends on the number of equivalent full thermal loading cycles anticipated during service of the component. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7000 thermal cycles. Therefore, the RCS pressure boundary piping analyzed under B31.1 is qualified for at least 7000 cycles (ASME Boiler and Pressure Vessel Code, Division 1, Subsection NC, Class 2 Components). The number of RCS heatups and cooldowns is maintained much less than 7000 cycles. Therefore, the pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Specific piping locations in the RCS pressure boundary were later reanalyzed to ASME Section III:

- Pressurizer surge line (for thermal stratification concerns).
- Thermowells installed in RCS (modifications to replace resistance temperature detector bypass piping).

The pressurizer surge line at the hot leg to surge line was evaluated for any increased effects from pressurizer insurges and outsurges as part of the NRC Bulletin 88-11 response.

The value of usage factor for the pressurizer surge line shown in Table 4.3-9 includes consideration of the original design transients plus additional usage due to the effects of thermal stratification.

When the resistance temperature detector bypass piping was removed and direct sensing nozzles installed on the hot and cold legs, thermowells were installed. UFSAR Sections 5.5.3.2 and 5.6 provide additional details of the configuration. These thermowells were qualified to ASME Section III. Calculations determined the thermowells were exempt from a detailed fatigue analysis (no CUF was calculated) since the conditions of 1983 ASME NB-3222.4(d) were satisfied. This exemption is based on the reactor coolant system transients shown in Tables 4.3-1 and 4.3-2 and is therefore considered a TLAA that will be managed by the Fatigue Monitoring Program.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor coolant system piping designed to ASME Section III in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-9
Cumulative Usage Factors for RCS Pressure Boundary Piping

Location	Usage Factor Unit 1	Usage Factor Unit 2
Hot leg to surge line	0.37043	0.36544

4.3.2 Non-Class 1 Systems

As shown in UFSAR Table 3.2.2-2, the non-Class 1 piping systems were designed to B31.1.0-1967, supplemented by use of the provisions of Class 2, NC-3600, ASME Section III, 1971 Edition up to and including Winter 1972 Addenda. This piping is addressed in LRA Section 4.3.2.1.

Some of the SQN Unit 1 and Unit 2 non-Class 1 piping that is not part of the RCS pressure boundary was analyzed to meet ASME Section III due to modifications or reanalysis and is addressed in LRA Section 4.3.2.2. Certain non-Class 1 heat exchangers were analyzed to ASME Section III and are reviewed In Section 4.3.2.3.

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 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 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 Non-Class 1 Piping with Fatigue Analysis

The following piping locations that are not part of the RCS pressure boundary were reanalyzed to calculate cumulative usage factors per ASME Section III.

- Pressurizer relief piping downstream of the relief valves
- Feedwater thermal sleeves liners and elbows

The pressurizer relief piping reanalysis included calculating a usage factor for portions of the relief piping. The transients evaluated for fatigue included earthquakes and upset transients of UFSAR Table 5.2.1-1 (loss of load transient and loss of power transient) that could result in a total of 120 safety relief valve discharge events.

The feedwater thermal sleeves, located just upstream of the steam generators, were installed in all four Unit 1 feedwater lines and in the Unit 2 feedwater lines for loops 2 and 3 due to concerns with cracking on the feedwater piping. As identified in UFSAR Table 3.2.1-2 sheet 5, the feedwater thermal sleeves are designed to ASME Section III Class B, and usage factors are calculated for the sleeve and the nozzle elbow weld. The fatigue analysis included the original design transients such as heatup/cooldown and loading/unloading and also included a location-specific transient of hours of AFW addition with automatic flow control that is identified in Tables 4.3-1 and 4.3-2 and tracked as part of the Fatigue Monitoring Program.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the non-RCS pressure boundary piping with cumulative usage factors in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-10
Non-Class 1 Piping with Fatigue Analysis (Cumulative Usage Factors)

Location	Usage Factor Unit 1	Usage Factor Unit 2
Pressurizer relief piping	0.966	0.988
Feedwater thermal sleeves liner	0.495	0.652
Feedwater nozzle elbow weld	0.925	0.246

4.3.2.3 Non-Class 1 Heat Exchangers with Fatigue Analysis

The following non-Class 1 heat exchangers were analyzed to ASME Section III:

- Residual heat removal (RHR) heat exchangers.
- Chemical and volume control system (CVCS) regenerative heat exchangers.

The RHR heat exchangers were evaluated for fatigue in a calculation by the vendor and determined to be exempt from a detailed fatigue analysis in accordance with Paragraph N-415-1 of ASME Section III. This exemption is based on cycles the heat exchangers would experience during 200 plant heatups and cooldowns. Since the plant cooldowns are tracked, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the RHR heat exchangers in accordance with 10 CFR 54.21(c)(1)(iii).

The CVCS regenerative heat exchangers were evaluated for fatigue in a calculation by the vendor and usage factors calculated for the piping, tubing, shell, and tubesheet. The analysis considered the following transients to bound the original 40 years of plant operation including 200 plant heatups and cooldowns:

(1) 2,000 step changes in letdown stream fluid temperature from 100°F to 560°F.

(2) 24,000 step changes in letdown stream temperature from 400°F to 560°F.

(3) 200 changes in letdown stream temperature from 100°F to 560°F occurring over four hours.

(4) 200 changes in letdown stream fluid temperature from 560°F to 140°F occurring over 20 hours.

(5) 200 pressurizations to respective design pressure and temperature.

The resulting total cumulative usage factors for all of these transients were very low as shown in the following table.

Table 4.3-11
Cumulative Usage Factors for the CVCS Regenerative Heat Exchangers

Location	Usage Factor (CUF)
Piping	0.03
Tubing	0.01
Shell	0.13
Tubesheet	0.03

These low usage factors indicates the cycles could be increased if necessary. The step changes in temperature actually occur at a very low rate, and therefore, the step change cycles need not be tracked. Since the plant heatups and cooldowns are tracked, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the CVCS 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. 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 (EAF) issue. 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. (Ref. 4-10)

NUREG/CR-6260 addresses the application of environmental factors to fatigue analyses (CUFs) and identifies locations of interest for consideration of environmental effects. Section 5.5 of NUREG/CR-6260 identified the following component locations to be the most sensitive to environmental effects for SQN-vintage Westinghouse plants. (Ref. 4-14) These locations and the subsequent calculations are directly relevant to SQN.

(1) Reactor vessel shell and lower head

(2) Reactor vessel inlet and outlet nozzles

(3) Pressurizer surge line (including hot leg and pressurizer nozzles)

(4) Reactor coolant piping charging system nozzle

(5) Reactor coolant piping safety injection nozzle

(6) RHR system Class 1 piping

Table 4.3-12 provides the results of screening evaluations for these locations. The evaluations use the guidance (formulas) provided in NUREG/CR-6583 for carbon and low-alloy steel (LAS) and NUREG/CR-5704 for austenitic stainless steel (SS). (Ref. 4-13, 4-15)

Dissolved oxygen in the SQN Unit 1 and Unit 2 RCS is controlled to less than 50 ppb.

Table 4.3-12
Environmentally Assisted Fatigue Cumulative Usage Factors

NUREG/CR-6260 Generic Location		Plant-Specific Location	Material Type	CUF	F_{en} [1]	EAF CUF
1	Reactor vessel shell and lower head	Inside the vessel wall adjacent to the core	LAS	0.005	2.45	0.01225
2	Reactor vessel inlet and outlet nozzles	Inlet nozzle	LAS	0.1121	2.45	0.2746
2	Reactor vessel inlet and outlet nozzles	Inlet nozzle safe end	SS	0.0009	15.36	0.0138
2	Reactor vessel inlet and outlet nozzles	Outlet nozzle	LAS	0.0446	2.45	0.1093
2	Reactor vessel inlet and outlet nozzles	Outlet nozzle safe end	SS	0.6318	15.36	> 1
3	Pressurizer surge line (including hot leg and pressurizer nozzles)	Pressurizer nozzle	LAS	U-1 0.49471 U-2 0.36634	2.45 2.45	> 1 0.8975
3	Pressurizer surge line (including hot leg and pressurizer nozzles)	Hot leg nozzle	SS	U-1 0.37043 U-2 0.36544	15.36 15.36	> 1 > 1
4	Reactor coolant piping charging system nozzle	NA	SS	NA [2]	NA	NA
5	Reactor coolant piping safety injection nozzle	NA	SS	NA	NA	NA
6	RHR system Class 1 piping	NA	SS	NA	NA	NA

1. F_{en} = fatigue correction factor
2. "NA" indicates a CUF is not available (not calculated) for this location.

An EAF CUF of less than 1 in this table does not exclude that location from further evaluation as described in the commitment. The commitment specifies a review to identify bounding locations and a reevaluation of all locations.

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 environmental correction factor 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 4.3-12, several locations have environmentally adjusted projected CUFs greater than 1.0 at the end of the period of extended operation. Due to the factor of safety included in the ASME code, a CUF of greater than 1.0 does not indicate that fatigue cracking is expected. However, there is a higher potential for fatigue cracking at locations having CUFs exceeding 1.0. SQN will manage the effects of fatigue, including EAF, under the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

As identified in the enhancement to the Fatigue Monitoring Program (see LRA Section B.1.11), prior to the period of extended operation, SQN 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. 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). SQN 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 (Ref. 4-16), 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.

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 cumulative usage factor (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). If an acceptable CUF cannot be calculated, SQN will repair or replace the affected locations before exceeding an environmentally adjusted CUF of 1.0.

Therefore, SQN will manage the effects of fatigue, including environmentally assisted fatigue, under the Fatigue Monitoring Program for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

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 sets forth requirements for an EQ program. 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 specify a qualification of at least 40 years, but less than 60 years, are considered TLAAs for license renewal.

The SQN Environmental Qualification (EQ) of Electric Components (SQN EQ Program) 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 SQN EQ Program ensures that the EQ components are maintained in accordance with their qualification bases.

The SQN EQ Program is an existing program established to meet SQN commitments for 10 CFR 50.49. The program is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components." The SQN 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 since the SQN Unit 1 and Unit 2 containment design does not include tendons.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSIS

As described in UFSAR Section 3.8.2, the containment vessel for SQN is a low-leakage, free-standing steel structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. UFSAR Figure 3.8.2-1 shows the outline and configuration of the containment vessel. The design of the containment vessel meets the requirements of the ASME Code, Section III, Winter Addenda 1968, applicable sections required for a Class B nuclear vessel, including Code cases 1177-5, 1290-1, 1330-1, 1413, and 1431. As described in UFSAR Section 3.8.2.5.1, shutdowns and startups do not occur with a frequency that required a design for fatigue failure, and therefore, there is no TLAA for the SQN containment vessels.

Analyses were identified for bellows assemblies for the penetrations that stated they were qualified for 7000 cycles of the design displacements. The number of design displacements expected to occur from either thermal changes or containment pressurizations is much less than 7000. Therefore, the associated penetration bellows are qualified for the period of extended operation. The analysis remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

UFSAR Section 3.8.3.4.5 identifies that the design life of the seal between the upper and lower compartment was initially estimated; however, the qualification of the seal is now determined by results of actual specimen testing and not an analysis. Testing is required by Technical Specification 3.6.5.9. Since this component is qualified by testing instead of an analysis, there is no associated TLAA.

4.7 OTHER PLANT-SPECIFIC TLAAS

4.7.1 Underclad Cracking Analysis

Reactor vessel underclad cracking involves cracks in base metal forgings immediately beneath austenitic stainless steel cladding which are created as a result of the weld-deposited cladding process. Westinghouse performed an analysis of flaw growth associated with underclad cracking in 1971, concluding that reactor vessel integrity could be assured for the entire 40-year original plant license term. Underclad cracking only requires analysis if examinations have detected flaws (the analysis is not used to postulate flaws). Indications that could be representative of underclad cracking flaws have been detected on both SQN Unit 1 and Unit 2; therefore, the underclad cracking analysis is considered a TLAA for SQN Unit 1 and Unit 2.

To extend this analysis to 60 years in support of license renewal, WCAP-15338-A, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants" (Ref. 4-12), provided an updated analysis of underclad cracking for Westinghouse units. This report examined the growth of underclad cracks in susceptible plants and showed that the crack growth would not threaten reactor vessel integrity through 60 years of plant operation. The NRC in their safety evaluation of this WCAP stated that any Westinghouse Owners Group plant may reference this report in a license renewal application to satisfy the requirements of 10 CFR 54.21(c)(1) regarding evaluation of TLAAs for reactor vessel components. The safety evaluation specified the following two renewal applicant action items.

1. Verify the plant is bounded by the WCAP-15338 report, specifically the number of cycles used in the analysis.

2. Ensure the TLAA is identified in a Final Safety Analysis Report supplement.

Transient cycles shown in WCAP-15338-A are equal to or greater than the number of cycles identified for the corresponding transients in LRA Tables 4.3-1 and 4.3-2. Section A.2.5.1 in LRA Appendix A, the UFSAR supplement, includes a description of the underclad cracking TLAA evaluation.

Therefore, this analysis has been projected per 10 CFR 54.21(c)(1)(ii).

4.7.2 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. 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 SQN was performed to determine which cranes were designed to CMAA-70. The manipulator cranes at SQN Unit 1 and Unit 2 included CMAA-70 in their design specification. The lowest number of load cycles a crane is qualified for under CMAA-70 is 100,000 cycles. SQN determined that the number of lifts each manipulator crane would experience in 60 years with a 1.25 multiplier for margin is ~20,500. Therefore, the expected number of lifts is well below the qualification in CMAA-70, and the manipulator cranes TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

No other cranes at SQN were built to CMAA-70 requirements. Section 3.8.6 of the UFSAR provides descriptions of the cranes, and UFSAR Section 3.12 describes the control of heavy loads and the NUREG-0612 responses. The SQN responses to NUREG-0612 and the review of the site cranes identified that the reactor building polar crane and the auxiliary building crane were not built to the structural fatigue requirements of CMAA-70. Aging management review results for the reactor building polar crane and the auxiliary building crane are included in LRA Section 3.5.

4.7.3 Leak-Before-Break Analysis

As described in UFSAR Section 3.6, the dynamic effects of double-ended postulated pipe ruptures in the reactor coolant loops have been eliminated from the SQN design basis by the application of leak-before-break (LBB) technology in accordance with the rule change to General Design Criterion 4. Authorization for their elimination (Ref. 4-18) is based on fracture mechanics analyses results performed by Westinghouse.

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 SQN.

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. Fully aged, bounding fracture toughness values were used in the evaluation for the cast fittings. As the LBB evaluations for both units 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 considered 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 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. The 60-year projections for SQN Unit 1 and Unit 2 provided in LRA Tables 4.3-1 and 4.3-2 show that no transient is projected to exceed the number of analyzed cycles prior to the end of the period of extended operation.

Therefore, the LBB TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

4.8 REFERENCES

4-1 NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 - The License Renewal Rule*, Revision 6, June 2005.

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

4-3 NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 2, December 2010.

4-4 EPRI Report TR-105090, *Guidelines to Implement the License Renewal Technical Requirements of 10 CFR 54 for Integrated Plant Assessments and Time-Limited Aging Analyses*, November 1995.

4-5 SQN Unit 1 Technical Specifications and SQN Unit 2 Technical Specifications.

4-6 10 CFR 50 Appendix G, Fracture Toughness Requirements.

4-7 10 CFR 50 Appendix H, Reactor Vessel Material Surveillance Program Requirements.

4-8 NRC Regulatory Guide 1.99, Radiation Embrittlement of Reactor Vessel Materials, Revision 2.

4-9 NRC Regulatory Guide 1.190, Calculational and Dosimetry Methods for Determining Vessel Neutron Fluence, March 2001.

4-10 SECY-95-245, Completion of the Fatigue Action Plan.

4-11 WCAP-16083-NP-A, Revision 0, "Benchmark Testing of the FERRET Code for Least Squares Evaluation of Light Water Reactor Dosimetry," S. L. Anderson, May 2006.

4-12 WCAP-15338-A, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants," W. Bamford and R. D. Rishel, October 2002.

4-13 NUREG/CR-5704 (ANL-98/31), *Effects of LWR Coolant Environments on Fatigue Design Curves of Austenitic Stainless Steels*, April 1999.

4-14 NUREG/CR-6260 (INEL 95/0045), *Application of NUREG/CR-5999 Interim Fatigue Curves to Selected Nuclear Power Plant Components*, February 1995.

4-15 NUREG/CR-6583 (ANL-97/18), *Effects of LWR Coolant Environments on Fatigue Design Curves of Carbon and Low-Alloy Steels*, March 1998.

4-16 NUREG/CR-6909 (ANL-06/08), *Effect of LWR Coolant Environments on the Fatigue Life of Reactor Materials*, February 2007.

4-17 WCAP-14040-A, Revision 4, "Methodology Used to Develop Cold Overpressure Mitigating System Setpoints and RCS Heatup and Cooldown Limit Curves," J. D. Andrachek et al., May 2004.

4-18 "Elimination of Primary Loop Pipe Breaks, General Design Criterion 4 (TAC Nos. 72829/ 72830) – Sequoyah Nuclear Plant Units 1 and 2," dated July 19, 1989 (A02890724007) enclosure Safety Evaluation Report.

Appendix A

Updated Final Safety Analysis Report Supplement

Sequoyah Nuclear Plant
License Renewal Application

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INTRODUCTION

This appendix provides the information to be submitted in an Updated Final Safety Analysis Report (UFSAR) Supplement as required by 10 CFR 54.21(d) for the Sequoyah Nuclear Plant (SQN) License Renewal Application (LRA). Appendix B of the SQN 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 UFSAR following issuance of the renewed operating license. Upon inclusion of the UFSAR Supplement in the SQN UFSAR, 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 SQN license renewal review (Section A.1) and time-limited aging analyses evaluated for the period of extended operation (Section A.2).

A.0 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

The SQN 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 UFSAR 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 dates of the original operating licenses for SQN Unit 1 and Unit 2.

A.1 AGING MANAGEMENT PROGRAMS

The integrated plant assessment for license renewal identified aging management programs necessary to provide reasonable assurance that components within the scope of license renewal will continue to perform their intended functions consistent with the current licensing basis (CLB) for the period of extended operation. 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 SQN (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities during the period of extended operation. SQN 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 SQN Quality Assurance Program applies to safety-related and important-to-safety 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 SQN 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 captured and systematically reviewed on an ongoing basis in accordance with the quality assurance program, which meets the requirements of 10 CFR Part 50, Appendix B, and the operating experience program, which meets the requirements of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff." 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, all incoming operating experience items are screened to determine whether they may involve age-related degradation or impact to aging management programs (AMPs). Items so identified are further evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined through these evaluations that the effects of aging may not be adequately managed.

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.

Plant-specific operating experience associated with aging management and age-related degradation is reported to the industry in accordance with guidelines established in the operating experience program.

A.1.1 Aboveground Metallic Tanks Program

The Aboveground Metallic Tanks Program manages loss of material and cracking for the outer surfaces of the aboveground metallic tanks using periodic visual inspections on tanks within the scope of license renewal as delineated in 10 CFR 54.4. For in-scope painted tanks, the program monitors the surface condition for blistering, flaking, cracking, peeling, discoloration, underlying rust, and physical damage. For in-scope stainless steel tanks, the program will monitor surface condition to assure a clean, shiny surface with no visible leaks. The visible exterior portions of the tanks will be inspected at least once every refueling cycle.

This program also manages the bottom surfaces of aboveground metallic tanks, which are constructed on a ring of concrete and oil-filled sand. The program requires ultrasonic testing (UT) of the tank bottoms to assess the thickness against the thickness specified in the design specification. The UT testing of the tank bottoms will be performed at least once within the five years prior to the period of extended operation and whenever the tanks are drained during the period of extended operation.

This program will be implemented prior to the period of extended operation.

A.1.2 Bolting Integrity Program

The Bolting Integrity Program manages loss of preload, cracking, and loss of material for closure bolting for safety-related and nonsafety-related pressure-retaining components using preventive and inspection activities. This program does not include the reactor head closure studs or 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. Inspection activities include those required by ASME Section XI for ASME Class 1, 2 and 3 pressure-retaining components. For non-ASME Code class bolts, periodic system walkdowns and inspection (at least once per refueling cycle) ensure identification of indications of loss of preload (leakage), cracking, and loss of material before leakage becomes excessive. With the exception of one reactor vessel closure stud, which is managed by the Reactor Head Closure Studs Program (Section A.1.33), no high-strength bolting has been identified at SQN. Identified leaking bolted connections will be monitored at an increased frequency in accordance with the corrective action process. Applicable industry standards and guidance documents, including NUREG-1339, EPRI NP-5769, and EPRI TR-104213, are used to delineate the program.

The Bolting Integrity Program will be enhanced as follows.

- Revise Bolting Integrity Program procedures to ensure the actual yield strength of replacement or newly procured bolts will be less than 150 ksi.

- Revise Bolting Integrity Program procedures to include the additional guidance and recommendations of EPRI NP-5769 for replacement of ASME pressure-retaining bolts and the guidance provided in EPRI TR-104213 for the replacement of other pressure-retaining bolts.

Enhancements will be implemented prior to the period of extended operation.

A.1.3 <u>Boric Acid Corrosion Program</u>

The Boric Acid Corrosion Program manages loss of material and increase in connection resistance for components on which borated reactor water may leak. The program consists of (a) visual inspection of external surfaces that are potentially exposed to borated water leakage, (b) timely discovery of leak path and removal of boric acid residues, (c) assessment of the damage, and (d) follow-up inspection for adequacy. This program was implemented in response to NRC Generic Letter (GL) 88-05 and industry operating experience.

A.1.4 <u>Buried and Underground Piping and Tanks Inspection Program</u>

The Buried and Underground Piping and Tanks Inspection Program manages loss of material and cracking for the external surfaces of buried and underground piping fabricated from carbon steel and stainless steel through preventive measures (i.e., coatings, backfill, and compaction), mitigative measures (e.g., electrical isolation between piping and supports of dissimilar metals), and periodic inspection activities (i.e., direct visual inspection of external surfaces, protective coatings, wrappings, and quality of backfill) during opportunistic or directed excavations. There are no underground or buried tanks at SQN for which aging effects are managed by the Buried and Underground Piping and Tanks Inspection Program.

Cathodic protection is not installed. If cathodic protection is not provided prior to the period of extended operation, the program will include documented justification that cathodic protection is not warranted. The justification should include the results of soil testing (including tests for soil resistivity, corrosion-accelerating bacteria, pH, moisture, chlorides and redox potential) to demonstrate that the soil environment is not corrosive to applicable buried components. The results of a review of at least ten years of operating experience must support the conclusion that cathodic protection is not warranted. The review of ten years of operating experience will include review of operating experience with components not in the scope of license renewal if they are fabricated from the same materials and exposed to the same environments as in-scope buried and underground components.

If a reduction in the number of inspections recommended in Table 4a of NUREG-1801, Section XI.M41 is claimed based on a lack of soil corrosivity as determined by soil testing, then soil testing should be conducted once in each ten-year period starting ten years prior to the period of extended operation.

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 air samples for moisture and contaminants and by opportunistically inspecting internal surfaces within compressed air systems. Inspection frequency and acceptance criteria are based on the SQN response to NRC GL 88-14 and SOER 88-01 along with applicable industry standards and documents such as ASME OM-S/G-1998, Part 17 and ISA-S7.0.1-1996 for guidance on testing and monitoring air quality.

The Compressed Air Monitoring Program will be enhanced as follows.

- Revise Compressed Air Monitoring Program procedures to include the standby diesel generator (DG) starting air subsystem.
- Revise Compressed Air Monitoring Program procedures to include maintaining moisture and other contaminants below specified limits in the standby DG starting air subsystem.
- Revise Compressed Air Monitoring Program procedures to apply a 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 maintain moisture, particulate size, and particulate quantity below acceptable limits in the standby DG starting air subsystem to mitigate loss of material.
- Revise Compressed Air Monitoring Program procedures to include periodic and opportunistic visual inspections consistent with frequencies described in ASME OM-S/G-1998, Part 17 of accessible internal surfaces such as compressors, dryers, after-coolers, and filter boxes of the following compressed air systems:
    - Diesel starting air subsystem

- Auxiliary controlled air subsystem
- Nonsafety-related controlled air subsystem

- Revise Compressed Air Monitoring Program procedures to monitor and trend moisture content in the standby DG starting air subsystem.
- Revise Compressed Air Monitoring Program procedures to include consideration of the guidance for acceptance criteria in ASME OM-S/G-1998, Part 17; EPRI NP-7079; and EPRI TR-108147.

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 SQN containment design is a low-leakage, free-standing steel containment founded on the circular concrete foundation slab of the shield building. The portion of SQN's containment that is classified as Class CC equivalent is the circular concrete foundation slab of the shield building. The bottom steel liner plate of the steel containment vessel was erected on top of the circular concrete foundation slab with a two-foot thick concrete slab poured on top of the liner plate. Since the Class CC equivalent concrete foundation slab and the bottom steel liner plate are inaccessible, they are exempted from examination in accordance with IWL-1220(b) and IWE-1220(b). There are no tendons associated with SQN's steel containment vessel. The code of record for the examination of the SQN containment, 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 is augmented by plant procedures that use the guidance of EPRI TR-104213, NUREG-1339, and EPRI NP-5769 to ensure proper specification of bolting material, lubricant and sealants, and installation torque.

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; Regulatory Guide 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. Type B containment leakage rate tests (LRT) are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. Type C tests are intended to detect local leaks and to measure leakage across containment isolation valves installed in containment penetrations or lines penetrating containment. Containment leakage rate tests are performed at frequencies that comply with the requirements 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 in piping, tanks, and components exposed to an environment of diesel fuel oil by verifying quality of the fuel oil source before allowing it to enter the fuel oil storage tanks, as well as periodic draining, cleaning, and inspection of the fuel oil storage tanks. Applicable industry standards and guidance documents are used to establish inspection frequency. Acceptance criteria for fuel oil quality parameters are specified in the SQN technical specifications.

The One-Time Inspection Program (Section A.1.29) describes inspections planned to verify that the Diesel Fuel Monitoring Program has been effective at managing aging effects.

The Diesel Fuel Monitoring Program will be enhanced as follows.

- Revise Diesel Fuel Monitoring Program procedures to monitor and trend sediment and particulates in the standby DG day tanks.

- Revise Diesel Fuel Monitoring Program procedures to monitor and trend levels of microbiological organisms in the seven-day storage tanks.

- Revise Diesel Fuel Monitoring Program procedures to include a ten-year periodic cleaning and internal visual inspection of the standby DG diesel fuel oil day tanks and high pressure fire protection (HPFP) diesel fuel oil storage tank. These cleanings and internal inspections will be performed at least once during the ten-year period prior to the period of extended operation and at succeeding ten-year intervals. If visual inspection is not possible, a volumetric inspection will be performed.

- Revise Diesel Fuel Monitoring Program procedures to include a volumetric examination of affected areas of the diesel fuel oil tanks, if evidence of degradation is observed during visual inspection. The scope of this enhancement includes the standby DG seven-day fuel oil storage tanks, standby DG fuel oil day tanks, and HPFP diesel fuel oil storage tank and is applicable to the inspections performed during the ten-year period prior to the period of extended operation and succeeding ten-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 and polymeric materials through periodic visual inspection of external surfaces during system inspections and walkdowns for evidence of leakage, loss of material (including loss of material due to wear), cracking, and change in material properties. When appropriate for the component and material, physical manipulation is used to augment visual inspections to confirm the absence of elastomer hardening and loss of strength. Inspections will be performed by personal qualified through plant-specific programs, and 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 components' intended functions are maintained.

The External Surfaces Monitoring Program will be enhanced as follows.

- Revise External Surfaces Monitoring Program procedures to clarify that periodic inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3) will be performed. Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject systems will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(2).

- Revise External Surfaces Monitoring Program procedures to include instructions to look for the following related to metallic components:
  - Corrosion and material wastage (loss of material).
  - Leakage from or onto external surfaces (loss of material).
  - Worn, flaking, or 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.
- Revise External Surfaces Monitoring Program procedures to include instructions for monitoring aging effects for flexible polymeric components through physical manipulations of the material, with a sample size for manipulation of at least ten percent of the available surface area. The inspection parameters for polymers shall include the following:
  - Surface cracking, crazing, scuffing, dimensional changes (e.g., ballooning and necking).
  - Discoloration.
  - Exposure of internal reinforcement for reinforced elastomers (loss of material).
  - Hardening as evidenced by loss of suppleness during manipulation where the component and material can be manipulated.
- Revise External Surfaces Monitoring Program procedures to ensure surfaces that are insulated will be inspected when the external surface is exposed (i.e., during maintenance) at such intervals that would ensure that the components' intended function is maintained.
- Revise External Surfaces Monitoring Program procedures to include acceptance criteria. Examples include the following:
  - Stainless steel should have a clean shiny surface with no discoloration.
  - Other metals should not have any abnormal surface indications.
  - Flexible polymers 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 polymers should have no erosion, cracking, checking or chalks.

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 by (a) tracking the number of critical thermal and pressure transients for selected components, (b) verifying that the severity of monitored transients are bounded by the design transient definitions for which they are classified, (c) assessing the impact of the reactor coolant environment on a set of sample critical components, and (d) addressing applicable fatigue exemptions.

The Fatigue Monitoring Program will be enhanced as follows.

- Revise Fatigue Monitoring Program procedures to monitor and track critical thermal and pressure transients for components that have been identified to have a fatigue TLAA.
- Fatigue usage calculations that consider the effects of the reactor water environment will be developed for a set of sample reactor coolant system components. This sample set will 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 will be determined as described in Section A.2.2.3.
- Fatigue usage factors for the reactor coolant system limiting components will be determined to address the Cold Overpressure Mitigation System (COMS) event (i.e., low temperature overpressurization event) and the effects of the structural weld overlays.
- 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 at least two years prior to entering 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 through periodic visual inspection of components and structures with a fire barrier intended function. It also performs functional testing of fire doors and inspections and testing of the CO_2 fire suppression system. The program includes visual inspections of not less than ten percent of each type of penetration seal at least once per refueling cycle and visual inspections of the fire barrier walls, ceilings and floors in structures within the scope of license renewal at a frequency of at least once per refueling cycle. Inspections of fire barriers include inspections of coatings and wraps. Periodic visual and functional tests are used to manage the aging effects of fire doors. The visual inspection frequency for fire doors is at least once per refueling cycle, and functional tests of closing mechanisms and latches for required doors is at least once per refueling cycle. The Fire Protection Program performs visual inspections of the CO_2 system every 18 months to identify conditions of corrosion. A functional test of the CO_2 system is performed every 18 months, which is consistent with the standards of NFPA 12A.

The Fire Protection Program will be enhanced as follows.

- Revise Fire Protection Program procedures to include an inspection of fire barrier walls, ceilings, and floors for any signs of degradation such as cracking, spalling, or loss of material caused by freeze thaw, chemical attack, or reaction with aggregates.

- Revise Fire Protection Program procedures to provide acceptance criteria of no significant indications of concrete cracking, spalling, and loss of material of fire barrier walls, ceilings, and floors and in other fire barrier materials.

Enhancements will be implemented prior to the period of extended operation.

A.1.13 <u>Fire Water System Program</u>

The Fire Water System Program manages loss of material and fouling for components in fire protection systems. The program includes periodic flushing and system performance testing in accordance with the applicable National Fire Protection Association (NFPA) commitments as described in the Fire Protection Report. System pressure is monitored such that loss of pressure is immediately detected and corrective action initiated. Portions of the system exposed to water are internally visually inspected. Sprinkler heads that have been in place for 50 years are tested if not replaced.

The Fire Water System Program will be enhanced as follows.

- Revise Fire Water System Program procedures to include periodic visual inspection of fire water system internals for evidence of corrosion and loss of wall thickness.

- Revise Fire Water System Program procedures to include one of the following options.
  - Wall thickness evaluations of fire protection piping using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material will be performed prior to the period of extended operation and periodically thereafter. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function.
  - A visual inspection of the internal surface of fire protection piping will be performed upon each entry into the system for routine or corrective maintenance. These inspections will be capable of evaluating (1) wall thickness to ensure against catastrophic failure and (2) the inner diameter of the piping as it applies to the design

flow of the fire protection system. Maintenance history shall be used to demonstrate that such inspections have been performed on a representative number of locations prior to the period of extended operation. A representative number is 20 percent of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Additional inspections will be performed as needed to obtain this representative sample prior to the period of extended operation and periodically during the period of extended operation based on the findings from the inspections performed prior to the period of extended operation.

- Revise Fire Water System Program procedures to ensure a representative sample of sprinkler heads will be tested or replaced before the end of the 50-year sprinkler head service life and at ten-year intervals thereafter during the extended period of operation. NFPA 25 defines a representative sample of sprinklers to consist of a minimum of not less than four sprinklers or one percent of the number of sprinklers per individual sprinkler sample, whichever is greater. If the option to replace the sprinklers is chosen, all sprinkler heads that have been in service for 50 years will be replaced.

- Revise Fire Water System Program procedures to consider implementing the flow testing requirements of NFPA 25 or justify why the flow testing requirements of NFPA should not be implemented.

- Revise Fire Water System Program procedures to include acceptance criteria for periodic visual inspection of fire water system internals for corrosion, minimum wall thickness, and the absence of biofouling in the sprinkler system that could cause corrosion in the sprinklers.

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 for carbon steel piping and components by (a) performing an analysis to determine systems subject to FAC and internal and external erosion, (b) conducting appropriate analysis to predict wall thinning, (c) performing wall thickness measurements based on wall thinning predictions, and (d) evaluating measurement results to determine the remaining service life and the need for replacement or repair of components. Measurement results are also used to confirm predictions and to plan long-term corrective action. The program relies on implementation of guidelines published by EPRI in NSAC-202L, Rev. 3, and 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 determining wall thickness. Components predicted to reach the minimum allowed wall thickness before the next scheduled outage are isolated, repaired, replaced, or reevaluated under the corrective action program.

The Flow-Accelerated Corrosion Program will be enhanced as follows.

- Revise Flow-Accelerated Corrosion Program procedures to implement NSAC-202L guidance for examination of components upstream of piping surfaces where significant wear is detected.

The enhancement will be implemented prior to the period of extended operation.

A.1.15 Flux Thimble Tube Inspection Program

The Flux Thimble Tube Inspection Program manages loss of material due to wear of the flux thimble tube walls from the reactor vessel instrument nozzles to the fuel assembly instrument guide tubes. Nondestructive examination methodology such as eddy current testing or other NRC-accepted inspection methods are used. This program implements the recommendations of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," in regards to nondestructive examinations such as eddy current testing or other justified and NRC-approved method used to monitor flux thimble tube wear.

The Flux Thimble Tube Inspection Program will be enhanced as follows.

- Revise Flux Thimble Tube Inspection Program procedures to include a requirement to address if the predictive trending projects that a tube will exceed 80 percent wall wear prior to the next planned inspection, then initiate a service request to define actions (i.e., plugging, repositioning, replacement, evaluations, etc.) required to ensure that the projected wall wear does not exceed 80 percent. If any tube is found to be greater than 80 percent through-wall wear, then initiate a service request to evaluate the predictive methodology used and modify as required to define corrective actions (i.e., plugging, repositioning, replacement, etc.).

The enhancement will be implemented prior to the period of extended operation.

A.1.16 Inservice Inspection Program

The Inservice Inspection Program manages loss of material, cracking, thermal embrittlement, flaw growth, 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 volumetric, surface, and/or visual examination and leakage testing of ASME Class 1, 2 and 3 component 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 ten 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.1.17 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 such as verification of clearances, settings, physical displacements, 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 is adequate to prevent significant degradation.

The ISI-IWF Program is augmented by plant procedures 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. These procedures include the guidance of EPRI TR-104213, NUREG-1339, and EPRI NP-5769 to ensure proper specification of bolting material, lubricant, and installation torque.

The ISI-IWF Program will be enhanced as follows.

- Revise ISI-IWF Program procedures to clarify that detection of aging effects will include monitoring anchor bolts for loss of material, loose or missing nuts, and cracking of concrete around the anchor bolts.

The enhancement will be implemented prior to the period of extended operation.

A.1.18 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 crane rail wear of cranes and hoists, based on industry standards and guidance documents. The program includes structural components, including structural bolting, that make up the bridge, the trolley, lifting devices, and rails in the rail system and includes cranes and hoists that meet the provisions of 10 CFR 54.4(a)(1) and (a)(2) as well as NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants." The activities rely on visual examinations and functional testing to ensure that cranes and hoists are capable of sustaining their rated loads, thus ensuring their intended function is maintained during the period of extended operation.

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will be enhanced as follows.

- Revise program procedures to specify the inspection scope will include monitoring of rails in the rail system for wear; monitoring structural components of the bridge, trolley and hoists for the aging effect of deformation, cracking, and loss of material due to corrosion; and monitoring structural connections/bolting for loose or missing bolts, nuts, pins or rivets and any other conditions indicative of loss of bolting integrity.

- Revise program procedures to include the inspection requirements of ASME B30.2.

- Revise program procedures to include the inspection frequency requirements of ASME B30.2.

- Revise program procedures to clarify that the acceptance criteria will include requirements for evaluation in accordance with ASME B30.2 of significant loss of material for structural components and structural bolts and significant wear of rail in the rail system.

- Revise program procedures to clarify that the acceptance criteria and maintenance and repair activities use the guidance provided in ASME B30.2.

Enhancements will be implemented prior to the period of extended operation.

A.1.19 Internal Surfaces in Miscellaneous Piping and Ducting Components Program

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages fouling, cracking, loss of material, and change in material properties using opportunistic visual inspections of the internal surfaces of piping and components during periodic surveillances or maintenance activities when the surfaces are accessible for visual inspection. For metallic components, visual inspection of surface conditions will be used to detect loss of material, fouling and cracking. For elastomeric components, visual inspections and physical manipulation will be used to detect cracking and change in material properties. The program monitors surface condition for visible evidence of loss of material in metallic components and changes in material properties for elastomeric components, including possible evidence of surface discontinuities. Visual examinations of elastomeric components are accompanied by physical manipulation such that changes in material properties are readily observable. The sample size for physical manipulation is at least ten percent of available surface area, including visually identified suspect areas.

Specific acceptance criteria are as follows:

- Stainless steel: clean surfaces, shiny, no abnormal surface condition.
- Metals: no abnormal surface condition.
- Flexible polymers: a uniform surface texture and color with no cracks, no unanticipated dimensional change, and no abnormal surface conditions.

- Rigid polymers: no surface changes affecting performance such as erosion and cracking.

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.1.20 Masonry Wall Program

The Masonry Wall Program is based on guidance provided in I.E. Bulletin 80-11, "Masonry Wall Design," and Information Notice (IN) 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to I.E. Bulletin 80-11." The scope of the Masonry Wall 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 will be implemented as part of the Structures Monitoring Program (Section A.1.40).

The program includes visual inspections of masonry walls identified as performing intended functions in accordance with 10 CFR 54.4. Included components are 10 CFR 50.48-required masonry walls, radiation shielding masonry walls, and masonry walls with the potential to affect safety-related components. Structural steel components, steel edge supports, and steel bracing of masonry walls are managed by the Structures Monitoring Program (Section A.1.40).

Masonry walls are inspected at least once every five years, with provisions for more frequent inspections, to ensure there is no loss of intended function between inspections.

Enhancements to this program are included in the enhancements to the Structures Monitoring Program (Section A.1.40).

A.1.21 Metal Enclosed Bus Inspection Program

The Metal Enclosed Bus Inspection Program is a condition monitoring program that 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.

MEB enclosure assemblies will be visually inspected internally 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 water intrusion. MEB enclosure assembly external surfaces will be inspected for evidence of loss of material and hardening and loss of strength (i.e., change in material properties) due to elastomer degradation. Bus insulation or insulators will be 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, or discoloration, which may indicate overheating or aging degradation. Internal bus supports or insulators are 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 ten years for loose connections 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. The alternative to quantitative measurements could be used for accessible MEB bolted connections covered with heat shrink tape or insulating boots. 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 five years for insulation material surface anomalies such as embrittlement, cracking, chipping, melting, discoloration, swelling, or surface contamination.

These inspections will be completed before the period of extended operation and every ten years thereafter provided the alternative visual inspection is not used as the only method to inspect a sample of accessible MEB bolted connections. If the alternative visual inspection is used to check a sample of accessible MEB bolted connections, the first inspection will be completed prior to the period of extended operation with subsequent inspections every five years thereafter.

This program will be implemented prior to the period of extended operation.

A.1.22 Neutron-Absorbing Material Monitoring Program

The Neutron-Absorbing Material Monitoring Program provides reasonable assurance that degradation of the neutron-absorbing material (Boral) used in spent fuel racks that could compromise the criticality analysis will be detected. The program relies on periodic inspection, testing, and other monitoring activities to assure that the required five percent sub-criticality margin is maintained during the period of extended operation.

The Neutron-Absorbing Material Monitoring Program will be enhanced as follows:

- Revise Neutron-Absorbing Material Monitoring Program procedures to perform blackness testing of the Boral coupons within the ten years prior to the period of extended operation and at least every ten years thereafter based on initial testing to determine possible changes in boron-10 areal density.

- Revise Neutron-Absorbing Material Monitoring Program procedures to relate physical measurements of Boral coupons to the need to perform additional testing.

- Revise Neutron-Absorbing Material Monitoring Program procedures to perform trending of coupon testing results to determine the rate of degradation and to take action as needed to maintain the intended function of the Boral.

Enhancements will be implemented prior to the period of extended operation.

A.1.23 Nickel Alloy Inspection Program

The Nickel Alloy Inspection Program manages cracking due to primary water stress corrosion cracking (PWSCC) for nickel-alloy 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 described in EPRI 1015009 (MRP-139, Rev. 1) and 10 CFR 50.55a. It provides (a) inspection requirements for the PWR vessel, pressurizer components, and piping that contain PWSCC-susceptible dissimilar metals (Alloys 600/82/182) and (b) inspection requirements for reactor coolant pressure boundary components.

A.1.24 Non-EQ Cable Connections Program

The Non-EQ Cable Connections Program is a 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 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.

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 based on twenty percent of the connection population with a maximum sample of 25.

Inspection methods may include thermography, contact resistance testing, or other appropriate quantitative test methods without removing the connection insulation, such as heat shrink tape, sleeving, insulating boots, etc., based on plant configuration and industry guidance.

The inspections will be performed prior to the period of extended operation.

A.1.25 Non-EQ Inaccessible Power Cables (400 V to 35 kV) Program

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) Program manages the aging effect of reduced insulation resistance on the inaccessible power (400 V to 35 kV) cable systems that have a license renewal intended function. The program includes 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). In this program, inaccessible power (400 V to 35 kV) cables exposed to significant moisture are tested at least once every six years to provide an indication of the condition of the cable insulation properties. 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 includes periodic inspections for water accumulation in manholes at least once every year (annually). In addition to the periodic manhole inspections, manhole inspections for water after event-driven occurrences, such as flooding, will be performed. Inspection frequency will be increased as necessary based on evaluation of inspection results.

This program will be implemented prior to the period of extended operation.

A.1.26 Non-EQ Instrumentation Circuits Test Review Program

The Non-EQ Instrumentation Circuits Test Review Program manages the aging effects of the applicable cables in the neutron monitoring and process radiation monitoring systems or sub-systems. The program provides reasonable assurance 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 ten 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 will occur at least once every ten 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.1.27 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.

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. 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.

This program will visually inspect accessible cables in an adverse localized environment at least once every ten years, with the first inspection prior to the period of extended operation.

This program will be implemented prior to the period of extended operation.

A.1.28 <u>Oil Analysis Program</u>

The Oil Analysis Program ensures that loss of material, cracking, and fouling are not occurring by maintaining the quality of 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 detrimental contaminants. Testing results indicating presence of water in oil samples initiate corrective action that may include evaluating for in-leakage. In addition, the Oil Analysis Program will include sampling and analysis of insulating oil.

The One-Time Inspection Program utilizes 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, cracking and fouling.

The Oil Analysis Program will be enhanced as follows:

- Revise Oil Analysis Program procedures to monitor and maintain contaminants in the 161-kV oil-filled cable system within acceptable limits through periodic sampling in accordance with industry standards, manufacturer's recommendations, and plant-specific operating experience.

- Revise Oil Analysis Program procedures to trend oil contaminant levels and initiate a problem evaluation report if contaminants exceed alert levels or limits in the 161-kV oil-filled cable system.

Enhancements will be implemented prior to the period of extended operation.

A.1.29 <u>One-Time Inspection Program</u>

The One-Time Inspection Program consists of a one-time inspection of selected components to accomplish the following:

- Verify the effectiveness of AMPs 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 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.

Determination of the sample size will be based on 20 percent of the components in each material-environment-aging effect group up to a maximum of 25 components. The sample size of components to be inspected will also be based on an assessment of operating experience. 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. 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 following table identifies parameters monitored and inspection methods for specific aging effects.

Aging Effect	Aging Mechanism	Parameter(s) Monitored	Inspection Method
Loss of material	Crevice corrosion	Surface condition Wall thickness	Visual (VT-1 or equivalent) and/or volumetric (ultrasonic testing [UT])
Loss of material	Galvanic corrosion	Surface condition Wall thickness	Visual (VT-3 or equivalent) and/or volumetric (UT)
Loss of material	General corrosion	Surface condition Wall thickness	Visual (VT-3 or equivalent) and/or volumetric (UT)

Aging Effect	Aging Mechanism	Parameter(s) Monitored	Inspection Method
Loss of material	MIC	Surface condition Wall thickness	Visual (VT-3 or equivalent) and/or volumetric (UT)
Loss of material	Pitting corrosion	Surface condition Wall thickness	Visual (VT-1 or equivalent) and/or volumetric (UT)
Loss of material	Erosion	Surface condition Wall thickness	Visual (VT-1 or equivalent) and/or volumetric (UT)
Loss of material	Wear	Wall thickness	Eddy current
Reduction of heat transfer	Fouling	Surface condition	Visual (VT-3 or equivalent)
Cracking	SCC or cyclic loading	Surface condition	Enhanced visual (EVT-1 or equivalent) or surface examination (magnetic particle, liquid penetrant) or volumetric (radiographic testing or UT)

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below.

Diesel Fuel Monitoring Program (Section A.1.8)	One-time inspection activity will verify the effectiveness of the Diesel Fuel Monitoring Program by confirming that unacceptable loss of material is not occurring.
Oil Analysis Program (Section A.1.28)	One-time inspection activity will verify the effectiveness of the Oil Analysis Program by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Water Chemistry Control Program (Section A.1.43)	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 fouling is not occurring.
Reactor vessel flange leak-off lines	One-time inspection activity will confirm that cracking and loss of material are not occurring or are so insignificant that an aging management program is not warranted.

Internal surfaces of the containment spray piping water seal area at water line region	One-time inspection activity will confirm that cracking is not occurring or is so insignificant that an aging management program is not warranted.
External surfaces of RHR heat exchanger tubes	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.

The inspections will be performed within the ten years prior to the period of extended operation.

A.1.30 One-Time Inspection – Small-Bore Piping Program

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 three percent sample or maximum of ten ASME Class 1 piping butt weld locations and a three percent sample or a maximum of ten 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, follow-up periodic inspection will be managed by a plant-specific program.

The inspection will be performed within the six-year period prior to the period of extended operation.

A.1.31 Periodic Surveillance and Preventive Maintenance Program

The Periodic Surveillance and Preventive Maintenance (PSPM) Program manages for specific components' aging effects not managed by other aging management programs, including loss of material, fouling, cracking, and change in material properties.

Credit for program activities has been taken in the aging management review of systems, structures and components as described below.

- Pressure test the divider barrier seal test coupon, and manually flex and visually monitor the surface condition of elastomeric components related to the seal between the upper and lower compartments (divider barrier) in reactor building to verify the absence of cracks, loss of material, and significant change in material properties.
- Visually inspect the surface condition of the portion of the 161-kV oil-filled cable from the CSST C to the 161- kV switchyard breakers that is in the trench to verify there are no adverse localized equipment environments for this cable. Perform an insulation resistance test.
- Perform an EVT-1 visual inspection of the surface condition of a representative sample of the standby diesel generator aluminum valve bodies to verify the absence of cracking due to stress corrosion cracking/intergranular attack (IGA); perform an EVT-1 visual inspection of the surface condition of a representative sample of DG lube oil cooler heat exchanger tubes to manage loss of material due to wear; perform an EVT-1 visual inspection of the surface condition to monitor for cracks in the standby DG exhaust expansion joint.
- Visually inspect the inside and outside surface condition of the component cooling carbon steel spool piece exposed to air – indoor to manage loss of material. In addition, for component cooling carbon steel piping exposed to stagnant treated water > 130ºF, perform sample inspection using ultrasonic testing (UT) to ensure no cracks exceed minimum wall thickness requirements.
- Visually inspect the inside and outside surface condition of the high pressure fire protection water system carbon steel spool piece exposed to air – indoor to manage loss of material.
- Visually inspect the inside surface condition of carbon steel RCP oil collection piping exposed to waste lube oil to manage loss of material.
- For ESF room coolers, perform air flow testing to manage fouling for copper alloy tubes and fins. Perform an inspection of the heat exchanger (tubes) surface condition to manage loss of material. Perform an EVT-1 visual inspection of the surface condition of a representative sample of aluminum valve bodies to verify the absence of cracking due to stress corrosion/IGA. Visually inspect surface condition of fan housing and exhaust fan cover surface condition to manage loss of material.

- Perform an air-side visual inspection of the surface condition of the auxiliary controlled air system after-cooler copper alloy tubes/fins for debris.
- Perform a visual or NDE inspection of the surface condition of the charging pump mini-flow orifices for evidence of erosion in the chemical volume and control system.
- Use visual or other NDE techniques to inspect the surface condition of the waste disposal stainless steel piping in the water line region in the containment floor and equipment sumps to manage the potential accelerated loss of material.
- Visually inspect the inside and outside surface condition of the carbon steel essential raw cooling water spool pieces exposed to air – indoor to manage loss of material.
- Nonsafety-related systems affecting safety-related systems:
  - Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel main steam (System 001) piping and piping components, orifices, tubing, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of auxiliary boiler (System 012) heat exchangers (shell and bonnet), piping and piping components, pump casings, sight glasses, strainer housings, tanks, tubing, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of steam generator blowdown (System 015) piping and piping components, pump casings, thermowells, tubing, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of stainless steel and carbon steel raw cooling water (System 024) cooler housings, piping and piping components, thermowells, tubing, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of carbon steel and copper alloy > 15% zinc or > 8% aluminum ventilation (Systems 030, 031, 044, 300, 311, 312, 313) damper housings, duct, fan housings, piping, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of carbon steel gland seal water (System 037) piping and pump casings to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel sampling and water quality (System 043) flow elements, piping and piping components, tubing, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of aluminum, carbon steel, and stainless steel demineralizer water and cask decon system and demineralizer water storage and distribution system (System 059/959) heater housings, piping and piping components, tanks, and valve bodies to manage loss of material.
  - Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel chemical volume and control (System 062) condenser shells,

cooler housings, demineralizers, ejectors, evaporators, filter housings, flow elements, heater housings, piping and piping components, pump casings, rupture discs, tanks, thermowells, traps, tubing, and valve bodies to manage loss of material.

- Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel essential raw water (System 067) flow elements, piping and piping components, pump casings, thermowells, tubing, and valve bodies to manage loss of material.
- Visually inspect the internal surface condition of a representative sample of carbon steel, copper alloy > 15% zinc or > 8% aluminum, and stainless steel component cooling (System 070) condenser shells, cooler shells, flow elements, piping and piping components, thermowells, tubing, and valve bodies to manage loss of material.
- Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel waste disposal (System 077) condenser shells, cooler housings, demineralizers, ejectors, evaporators, filter housings, flow elements, heat exchanger shells, piping and piping components, pump casings, sight glasses, tanks, thermowells, traps, tubing, and valve bodies to manage loss of material.
- Visually inspect the internal surface condition of a representative sample of stainless steel primary water makeup (System 081) piping to manage loss of material.
- Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel upper head injection (System 087) piping and piping components, pumps, rupture discs, tanks, tubing, and valve bodies to manage loss of material.
- Visually inspect the internal surface condition of a representative sample of stainless steel radiation monitoring (System 090) valve bodies to manage loss of material.
- Visually inspect the internal surface condition of a representative sample of carbon steel, copper alloy > 15% zinc or > 8% aluminum, and stainless steel water treatment and makeup water treatment (Systems 028/928) flow elements, orifices, piping and piping components, pump casings, sight glasses, tanks, thermowells, traps, tubing, and valve bodies to manage loss of material.
- Visually inspect the internal surface condition of stainless steel station drainage and sewage (040/305) piping to manage loss of material.

The PSPM Program will be enhanced as follows.

- Revise PSPM Program procedures as necessary to assure 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.

This enhancement will be implemented prior to the period of extended operation.

A.1.32 Protective Coating Monitoring and Maintenance Program

The Protective Coating Monitoring and Maintenance Program monitors and maintains Service Level I coatings applied to carbon steel and concrete surfaces inside containment (e.g., steel containment vessel shell, structural steel, supports, penetrations, and concrete walls and floors). The program serves to prevent or minimize loss of material due to corrosion of carbon steel components and aids in decontamination. The program addresses accessible coated surfaces inside containment. The SQN program was developed based on the guidance contained in NRC RG 1.54, Revision 0; however, the program will be enhanced to meet the technical basis of Regulatory Position C4 in NRC RG 1.54, Revision 2, and ASTM D 5163-08. With these enhancements, 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 systems suction strainers, reducing flow through the system and possibly causing unacceptable head loss for the pumps.

The Protective Coating Monitoring and Maintenance Program will be enhanced as follows.

- Revise Protective Coating Monitoring and Maintenance Program procedures to clarify that detection of aging effects will include inspection of coatings near sumps or screens associated with the emergency core cooling system.

- Revise Protective Coating Monitoring and Maintenance Program procedures to clarify that instruments and equipment needed for inspection may include, but not be limited to, flashlights, spotlights, marker pen, mirror, measuring tape, magnifier, binoculars, camera with or without wide-angle lens, and self-sealing polyethylene sample bags.

- Revise Protective Coating Monitoring and Maintenance Program procedures to clarify that the last two performance monitoring reports pertaining to the coating systems will be reviewed prior to the inspection or monitoring process.

Enhancements will be implemented prior to the period of extended operation.

A.1.33 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program manages cracking and loss of material for reactor head closure studs using inservice inspection (ASME Section XI 2001 Edition 2003 Addendum Table IWB-2500-1) and preventive measures to mitigate cracking. The program also relies on recommendations to address reactor head closure studs degradation listed in NUREG-1339 and NRC Regulatory Guide 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 ksi.

- Revise Reactor Head Closure Studs Program procedures to exclude the use of molybdenum disulfide (MoS_2) on the reactor vessel closure studs and to refer to Reg. Guide 1.65, Rev. 1.

Enhancements will be implemented prior to the period of extended operation.

A.1.34 Reactor Vessel Internals Program

The Reactor Vessel Internals Program includes reactor vessel internal components for SQN Unit 1 and Unit 2, which are Westinghouse NSSS design, with the exception of fuel assemblies, reactivity control assemblies, nuclear instrumentation, and welded attachments to the reactor vessel. The program performs the following: (1) manages cracking, loss of material, reduction of fracture toughness, change in dimension and loss of preload for reactor vessel internal components intended to provide core support; (2) implements the guidance of Electric Power Research Institute (EPRI) Report No. 1022863, "Materials Reliability Program: Pressurized Water Reactor Internals Inspection and Evaluation Guidelines (MRP-227-A)," including the plant-specific action items, conditions and limitations identified in the NRC SE (Rev. 1) for MRP-227; (3) implements the guidelines of EPRI Report No. 1016609, "Materials Reliability Program: Inspection Standard for PWR Internals (MRP-228)"; (4) incorporates "acceptance criteria" recommendations from Section 3.1.2.2 of NUREG-1800; (5) discusses how to disposition nonconforming reactor vessel internals components; (6) incorporates the definition of sampling-based condition monitoring found in NRC Branch Technical Position RSLB-1; and (7) uses a four-step ranking process (i.e., primary, expansion, existing and no additional measure components).

The result of the four-step sample selection process is a set of primary internals component locations for the SQN reactor vessel internals design that are expected to show leading indications of the degradation effects, with another set of expansion internals component locations that are specified to expand the sample should the indications be more severe than anticipated. The degradation of the third set of internals locations 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. A fourth set of internal locations 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 program uses inspection techniques consistent with MRP-227-A and MRP-228.

The Reactor Vessel Internals Program will be enhanced as follows.

- Revise Reactor Vessel Internals Program procedures to take physical measurements of the Type 304 stainless steel hold-down springs in Unit 1 at each refueling outage to ensure preload is adequate for continued operation.

- Revise Reactor Vessel Internals Program procedures to include preload acceptance criteria for the Type 304 stainless steel hold-down spring in Unit 1.

Enhancements will be implemented prior to the period of extended operation.

A.1.35 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. In addition, the program will consider reduction in fracture toughness and long-term operating conditions for the area outside the beltline.

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) determine the need for operating restrictions on the inlet temperature, neutron spectrum, and neutron flux. 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.

The Reactor Vessel Surveillance Program will be enhanced as follows.

- Revise Reactor Vessel Surveillance Program procedures to consider the area outside the beltline such as nozzles, penetrations and discontinuities to determine if more restrictive pressure-temperature limits are required than would be determined by just considering the reactor vessel beltline materials.

- Revise Reactor Vessel Surveillance Program procedures to develop an NRC-approved schedule for capsule withdrawals to meet ASTM E 185-82 requirements, including the possibility of operation beyond 60 years.
- Revise Reactor Vessel Surveillance Program procedures to withdraw and test a standby capsule to cover the peak fluence expected at the end of the period of extended operation.

Enhancements will be implemented prior to the period of extended operation.

A.1.36 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program

SQN is not committed to the requirements of NRC Regulatory Guide (RG) 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." However, the program at SQN was developed based on guidance provided in the NRC RG 1.127, Revision 1, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," and provides an inservice inspection and surveillance program for the SQN slopes, channels and raw water-control structures associated with emergency cooling water systems or flood protection. The scope of the SQN program includes water-control 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 water-control structures and structural components. The program addresses age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect water-control structures so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner. The program will be implemented as part of the Structures Monitoring Program (Section A.1.40).

Enhancements to this program are included in the enhancements to the Structures Monitoring Program (Section A.1.40).

A.1.37 Selective Leaching Program

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 exposed to raw water, waste water, treated water, or ground water. A sample population is defined as components with the same material and environment combination. The sample population will focus on bounding or leading components most susceptible to aging due to time in service, severity of operating condition, and lowest design margin. The program includes 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.

Follow-up for unacceptable inspection findings includes an evaluation using the corrective action program and possible expansion of the inspection sample size and location.

This inspection will be performed within the five years prior to the period of extended operation.

A.1.38 Service Water Integrity Program

The Service Water Integrity Program manages loss of material and fouling for components fabricated from carbon steel, carbon steel clad with stainless steel, cast iron, copper alloy, nickel alloy, or stainless steel exposed to ERCW as described in the SQN response to NRC GL 89-13. The program includes (a) surveillance and control techniques to manage effects of biofouling, corrosion, erosion, coating failures, 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; and (d) routine inspections and maintenance.

A.1.39 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.

The Steam Generator Integrity Program will be enhanced as follows.

- Revise Steam Generator Integrity Program procedures to ensure that corrosion resistant materials are used for replacement steam generator tube plugs.

The enhancement will be implemented prior to the period of extended operation.

A.1.40 Structures Monitoring Program

The Structures Monitoring Program provides for aging management of structures and structural components, including structural bolting, within the scope of license renewal. The program was developed based on guidance in Regulatory Guide 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, concrete masonry blocks, and other structures such as earthen structures. Inspections are performed at least once every five years, with provisions for more frequent inspections, to ensure there is no loss of intended function between inspections. The scope of the program also includes the condition monitoring of masonry walls and water-control structures as described in the Masonry Wall Program (Section A.1.20) and in the NRC Regulatory Guide 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," aging management program (Section A.1.36).

The Structures Monitoring Program is augmented by plant procedures 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. These procedures include the guidance of EPRI TR-104213, NUREG-1339, and EPRI NP-5769 to ensure proper specification of bolting material, lubricant, and installation torque.

The Structures Monitoring Program will be enhanced as follows.

- Revise Structures Monitoring Program procedures to include the following in-scope structures.
  - Carbon dioxide building
  - Condensate storage tanks' (CSTs) foundations and pipe trench
  - East steam valve room Units 1 & 2
  - Essential raw cooling water (ERCW) pumping station
  - High pressure fire protection (HPFP) pump house and water storage tanks' foundations
  - Radiation monitoring station (or particulate iodine and noble gas station) Units 1 & 2
  - Skimmer wall (Cell No. 12)
  - Transformer and switchyard support structures and foundations

- Revise Structures Monitoring Program procedures to specify the following list of in-scope structures are included in the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (Section A.1.36):
  - Condenser cooling water (CCW) pumping station (also known as intake pumping station) and retaining walls
  - CCW pumping station intake channel
  - ERCW discharge box
  - ERCW protective dike
  - ERCW pumping station and access cells
  - Skimmer wall, skimmer wall Dike A and underwater dam

- Revise Structures Monitoring Program procedures to include the following in-scope structural components and commodities.
  - Anchor bolts

- Anchorage/embedments (e.g., plates, channels, unistrut, angles, other structural shapes)
- Beams, columns and base plates (steel)
- Beams, columns, floor slabs and interior walls (concrete)
- Beams, columns, floor slabs and interior walls (reactor cavity and primary shield walls; pressurizer and reactor coolant pump compartments; refueling canal, steam generator compartments; crane wall and missile shield slabs and barriers)
- Building concrete at locations of expansion and grouted anchors; grout pads for support base plates
- Cable tray
- Cable tunnel
- Canal gate bulkhead
- Compressible joints and seals
- Concrete cover for the rock walls of approach channel
- Concrete shield blocks
- Conduit
- Control rod drive missile shield
- Control room ceiling support system
- Curbs
- Discharge box and foundation
- Doors (including air locks and bulkhead doors)
- Duct banks
- Earthen embankment
- Equipment pads/foundations
- Explosion bolts (E. G. Smith aluminum bolts)
- Exterior above and below grade; foundation (concrete)
- Exterior concrete slabs (missile barrier) and concrete caps
- Exterior walls: above and below grade (concrete)
- Foundations: building, electrical components, switchyard, transformers, circuit breakers, tanks, etc.
- Ice baskets
- Ice baskets lattice support frames
- Ice condenser support floor (concrete)
- Intermediate deck and top deck of ice condenser
- Kick plates and curbs (steel—inside steel containment vessel)
- Lower inlet doors (inside steel containment vessel)

- Lower support structure structural steel: beams, columns, plates (inside steel containment vessel)
- Manholes and hand holes
- Manways, hatches, manhole covers, and hatch covers (concrete)
- Manways, hatches, manhole covers, and hatch covers (steel)
- Masonry walls
- Metal siding
- Miscellaneous steel (decking, grating, handrails, ladders, platforms, enclosure plates, stairs, vents and louvers, framing steel, etc.)
- Missile barriers/shields (concrete)
- Missile barriers/shields (steel)
- Monorails
- Penetration seals
- Penetration seals (steel end caps)
- Penetration sleeves (mechanical and electrical not penetrating primary containment boundary)
- Personnel access doors, equipment access floor hatch and escape hatches
- Piles
- Pipe tunnel
- Precast bulkheads
- Pressure relief or blowout panels
- Racks, panels, cabinets and enclosures for electrical equipment and instrumentation
- Riprap
- Rock embankment
- Roof or floor decking
- Roof membranes
- Roof slabs
- RWST rainwater diversion skirt
- RWST storage basin
- Seals and gaskets (doors, manways and hatches)
- Seismic/expansion joint
- Shield building concrete foundation, wall, tension ring beam and dome: interior, exterior above and below grade
- Steel liner plate
- Steel sheet piles
- Structural bolting
- Sumps (concrete)

- Sump liners (steel)
- Sump screens
- Support members; welds; bolted connections; support anchorages to building structure (e.g., non-ASME piping and components supports, conduit supports, cable tray supports, HVAC duct supports, instrument tubing supports, tube track supports, pipe whip restraints, jet impingement shields, masonry walls, racks, panels, cabinets and enclosures for electrical equipment and instrumentation)
- Support pedestals (concrete)
- Transmission, angle and pull-off towers
- Trash racks
- Trash racks associated structural support framing
- Traveling screen casing and associated structural support framing
- Trenches (concrete)
- Tube track
- Turning vanes
- Vibration isolators

- Revise Structures Monitoring Program procedures to specify masonry walls located in the following in-scope structures are in the scope of the Masonry Wall Program:
  - Auxiliary building
  - Reactor building Units 1 & 2
  - Control bay
  - ERCW pumping station
  - HPFP pump house
  - Turbine building

- Revise Structures Monitoring Program procedures to include periodic sampling and chemical analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every five years.

- Revise Structures Monitoring Program procedures to include the following parameters to be monitored or inspected:
  - Requirements for concrete structures based on ACI 349-3R and ASCE 11 and include monitoring the surface condition for 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.
  - Loose or missing nuts for structural bolting.
  - Monitoring gaps between the structural steel supports and masonry walls that could potentially affect wall qualification.

- Revise Structures Monitoring Program procedures to include the following components to be monitored for the associated parameters:
  - Anchors/fasteners (nuts and bolts) will be monitored for loose or missing nuts and/or bolts, and cracking of concrete around the anchor bolts.
  - Elastomeric vibration isolators and structural sealants will be monitored for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening).

- Revise Structures Monitoring Program procedures to include the following for detection of aging effects:
  - Inspection of structural bolting for loose or missing nuts.
  - Inspection of anchor bolts for loose or missing nuts and/or bolts, and cracking of concrete around the anchor bolts.
  - Inspection of elastomeric material for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening), and supplement inspection 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 ten percent of available surface area.
  - Opportunistic inspections when normally inaccessible areas (e.g., high radiation areas, below-grade concrete walls or foundations, buried structures) become accessible due to required plant activities. Additionally, inspections will be performed of inaccessible areas in environments where observed conditions in accessible areas exposed to the same environment indicate that significant degradation is occurring.
  - Inspection of submerged structures at least once every five years.
  - Inspections of water control structures which should be conducted under the direction of qualified personnel experienced in the investigation, design, construction, and operation of these types of facilities.
  - Inspections of water control structures on an interval not to exceed five years.
  - Performance of special inspections of water control structures immediately (within 30 days) following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls.

- Verify acceptance criteria in Structures Monitoring Program procedures is based on information provided in industry codes, standards, and guidelines including NEI 96-03, ACI 201.1R-92, ANSI/ASCE 11-99 and ACI 349.3R-02. Industry and plant-specific operating experience will also be considered in the development of the acceptance criteria.

Enhancements will be implemented prior to the period of extended operation.

A.1.41 Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program manages the aging effects of cracking and reduction in fracture toughness in cast austenitic stainless steel (CASS) components. The program consists of a determination of the susceptibility of CASS piping, piping components, and piping elements and the pressurizer spray head and regenerative heat exchanger shell 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 volumetric 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.1.42 Water Chemistry Control – Closed Treated Water Systems Program

The Water Chemistry Control – Closed Treated Water Systems Program manages loss of material, cracking, and fouling in components exposed to a treated water environment through monitoring and control of water chemistry (including the use of corrosion inhibitors), as well as visual inspections to determine the presence of corrosion and/or cracking. The latest revision of the EPRI closed-cycle cooling guidelines and operating experience 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 provide a corrosion inhibitor for the following chilled water subsystems in accordance with industry guidelines and vendor recommendations:
    - Auxiliary building cooling
    - Incore Chiller 1A, 1B, 2A, & 2B
    - 6.9 kV Shutdown Board Room A & B
- Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to conduct inspections whenever a boundary is opened for the following systems:
    - Standby diesel generator jacket water subsystem
    - Component cooling system
    - Glycol cooling loop system
    - High pressure fire protection diesel jacket water system
    - Chilled water portion of miscellaneous HVAC systems (i.e., auxiliary building, Incore Chiller 1A, 1B, 2A, & 2B, and 6.9 kV Shutdown Board Room A & B)

These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection and personnel qualification procedures that are capable of detecting corrosion or cracking.

- Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to perform sampling and analysis of the glycol cooling system 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 inspect a representative sample of piping and components at a frequency of once every ten years for the following systems:
  - Standby diesel generator jacket water subsystem
  - Component cooling system
  - Glycol cooling loop system
  - High pressure fire protection diesel jacket water system
  - Chilled water portion of miscellaneous HVAC systems (i.e., auxiliary building, Incore Chiller 1A, 1B, 2A, & 2B, and 6.9 kV Shutdown Board Room A & B)

  Components inspected will be those with the highest likelihood of corrosion or cracking. 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. These inspections will be in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection and personnel qualification procedures that ensure the capability of detecting corrosion or cracking.

Enhancements will be implemented prior to the period of extended operation.

A.1.43 Water Chemistry Control – Primary and Secondary Program

The Water Chemistry Control – Primary and Secondary Program manages loss of material, cracking, and fouling in components exposed to a treated water environment 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. 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.1.29) 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, 52 EFPY is used to bound the expected EFPY for both units.

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 SQN Unit 1 and Unit 2 reactor pressure vessel beltline material have been projected to 52 EFPY of operation.

The methods used to calculate the SQN Unit 1 and Unit 2 vessel fluence satisfy the criteria set forth in Regulatory Guide 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.

UFSAR Section 5.4.3.7 provides additional information on the specimen capsules and the associated dosimeters used to monitor reactor vessel embrittlement and neutron fluence. See Section A.1.35 for additional information on the Reactor Vessel Surveillance Program.

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 original and extended 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 52 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 Regulatory Guide 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 Regulatory Guide 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 52 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 Regulatory Guide 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 original beltline and extended beltline materials in the SQN Unit 1 and Unit 2 reactor vessels are projected to remain above the USE limit of 50 ft-lb (per 10 CFR 50 Appendix G) through 52 EFPY. Therefore, the SQN Unit 1 and Unit 2 reactor vessel Charpy USE TLAAs have 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(b)(1) 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(b)(2) establishes screening criteria for RT_{PTS} at 270°F for plates, forgings, and axial welds and 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 Regulatory Guide 1.99, Revision 2. Adjusted reference temperatures are calculated for both Positions 1 and 2 by following the guidance in Regulatory Guide 1.99, Sections 1.1 and 2.1, respectively, using copper and nickel content of beltline materials and end-of-life fluence projections.

The beltline and extended beltline materials in the Unit 1 and Unit 2 reactor vessels are below the RT_{PTS} screening criteria values of 270°F for forgings and 300°F for circumferentially oriented welds through 52 EFPY. Therefore, the SQN Unit 1 and Unit 2 reactor vessel RT_{PTS} TLAAs have 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.1.35). 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.

SQN Unit 1 Technical Specification 3.4.9.1 and the SQN Unit 2 Technical Specification 3.4.9.1 require the RCS pressure, RCS temperature, and RCS heatup and cooldown rates to be maintained within the limits specified in the P-T limits report (PTLR). The Technical Specifications Administrative Controls Section 6.9.1.15 provides additional details on the PTLR and the Westinghouse topical reports that provide the analytical methods used to determine the RCS P-T limits. It requires the analytical methods used to determine the RCS P-T limits to be those previously reviewed and approved by the NRC and requires the PTLR to be provided to the NRC within 30 days of issuance of any revision or supplement thereto.

The analyses used to determine the P-T limit curves, including the associated WCAP supporting documentation, are considered TLAAs. The SQN Unit 1 and Unit 2 P-T limit curves contained in each plant's PTLR provide the limits through 32 EFPY. Prior to exceeding 32 EFPY, SQN will generate new PTLRs to cover plant operation beyond 32 EFPY. As required by Technical Specification 6.9.1.15, the P-T limit curves will be developed using NRC-approved analytical methods.

The SQN Unit 1 and Unit 2 P-T limit curves in each plant's PTLR 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.1.35). The analysis of the P-T curves will consider locations outside of the beltline such as nozzles, penetrations and other discontinuities to determine if more restrictive P-T limits are required than would be determined by considering only the reactor vessel beltline materials. Therefore, the 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) PORV Setpoints

The SQN Unit 1 Technical Specification 3.4.12 and SQN Unit 2 Technical Specification 3.4.12 specify that the power operated relief valve (PORV) setpoints must be at lift settings within the limits of the PTLR. Additional descriptions of the PORV setpoint and the PTLR are provided in the Technical Specification 3/4.4.12 Bases. Each time the P-T limit curves are revised, the LTOP PORV setpoints must be reevaluated. Therefore, low temperature overpressure protection limits are considered part of the calculation of P-T curves in each plant's PTLR. The P-T limit curves are updated prior to exceeding applicable EFPY limits. See UFSAR Section A.2.1.4 for further information on the P-T limit curves. Therefore, the LTOP PORV setpoint 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 the 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 SQN 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

The major Class 1 components at SQN include the reactor vessels, pressurizers, reactor coolant pumps, steam generators, control rod drives, and all associated piping and valves. Fatigue evaluations performed in the design of SQN 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.

SQN Technical Specification 6.8.4.l identifies a component cyclic and transient limit program to provide controls to track the UFSAR Section 5.2.1 cyclic and transient occurrences. UFSAR Section 5.2.1 and UFSAR Table 5.2.1-1 summarize the reactor coolant system cyclic or transient limits. In addition, the Technical Requirements Manual surveillance requirement 4.4.9.2.2 requires the recording of any occurrence of pressurizer spray operation with a differential temperature greater than 320°F for evaluation of the cyclic limits.

SQN 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 SQN Fatigue Monitoring Program monitors transient cycles that contribute to fatigue usage and is further described in UFSAR Section A.1.11.

Reactor Vessels

As described in UFSAR Section 5.4, design and fabrication of the reactor vessels was in accordance with ASME Section III, Class A. SQN 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 in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Vessel Internals

As indicated by the title of UFSAR Section 3.9.3, the design of SQN Units 1 and 2 reactor vessel internals was not covered by the ASME code. SQN Unit 1 and Unit 2, therefore, do not have an ASME stress report for the originally supplied reactor vessel internals.

Stress reports were generated for several specific reactor vessel internals locations to support component replacement or reanalysis. Usage factors were calculated for the CRD guide tube pins replacement components. The lower core plate was reanalyzed as part of the measurement uncertainty recapture power uprate that included the determination of a usage factor.

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).

Pressurizers

As described in UFSAR Section 5.5.10, the pressurizers are vertical, cylindrical vessels with essentially hemispherical top and bottom heads constructed of carbon steel, with austenitic stainless steel cladding on all surfaces exposed to reactor coolant. The surge line nozzle and electric heaters are installed in the bottom head.

The original analysis assumed the surge nozzle configuration would cause mixing of the water in the pressurizers during insurges. Later studies identified that the lower temperature water would enter the pressurizer and stratify. In a joint project with Duke Power, TVA developed an algorithm to use a mass balance approach to predict the flow rate at the bottom head of the pressurizer and calculate the associated fatigue impact.

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).

Replacement Steam Generators

The replacement steam generators for both SQN Unit 1 and Unit 2 were designed to ASME Boiler and Pressure Vessel Code, Section III, Division 1, 1989 Edition with no Addenda. The SQN Unit 1 steam generators were replaced in the spring of 2003, and the SQN Unit 2 steam generators were replaced in the fall of 2012. The replacement steam generators were designed for a 40-year life. Therefore, the 40-year design covers a time period beyond the end of the period of extended operation (2040 for Unit 1 and 2041 for Unit 2).

The Fatigue Monitoring Program (with enhancements) will manage the effects of aging due to fatigue on the steam generators in accordance with 10 CFR 54.21(c)(1)(iii).

Control Rod Drive Mechanisms

The control rod drive mechanisms are described in UFSAR Section 4.2.3.2.2 and shown in UFSAR Figure 4.2.3-7. The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the control rod drives in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Coolant Pumps

As described in UFSAR Section 5.2, the reactor coolant pumps are vertical, single stage, centrifugal, shaft seal pumps. The reactor coolant pump configuration is shown in UFSAR Figure 5.5.1-1. 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).

Reactor Coolant System Piping

As shown in UFSAR Table 3.2.2-2 and discussed in UFSAR Section 5.5.3, the original design analyses for the reactor coolant system piping was in accordance with USAS B31.1. This piping was not analyzed for specific design transients. The USAS B31.1 fatigue design is based on an implicit treatment of cyclic loadings, through a stress range reduction factor applied to the stress allowables that depends on the number of equivalent full thermal loading cycles anticipated during service of the component. In general, a stress range reduction factor of 1.0 in the stress analyses applies for up to 7000 thermal cycles. Therefore, the RCS pressure boundary piping analyzed under B31.1 is qualified for at least 7000 cycles (ASME Boiler and Pressure Vessel Code, Division 1, Subsection NC, Class 2 Components). The number of RCS heatups and cooldowns is maintained much less than 7000 cycles. Therefore, the pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Specific piping locations in the RCS pressure boundary were later reanalyzed to ASME Section III:

- Pressurizer surge line.
- Thermowells installed in RCS (to replace resistance temperature detector bypass piping).

The pressurizer surge line at the hot leg to surge line was evaluated for any increased effects from pressurizer insurges and outsurges as part of the NRC Bulletin 88-11 response.

When the resistance temperature detector bypass piping was removed and direct sensing nozzles installed on the hot and cold legs, thermowells were installed. UFSAR Sections 5.5.3.2 and 5.6 provide additional details of the configuration. These thermowells were qualified to ASME Section III. Calculation determined the thermowells were exempt from a detailed fatigue analysis (no CUF was calculated) since the conditions of the 1983 ASME NB-3222.4(d) were satisfied. This exemption was based on not exceeding the number of transient cycles and is therefore treated as a TLAA that will be managed by the Fatigue Monitoring Program. See UFSAR Section A.1.11 for further information on the program.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor coolant system piping designed to ASME Section III in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.2 Non-Class 1 Metal Fatigue

As shown in UFSAR Table 3.2.2-2, the non-Class 1 piping systems were designed to B31.1.0-1967, supplemented by use of the provisions of Class 2, NC-3600, ASME Section III, 1971 Edition up to and including Winter 1972 Addenda. Some of the SQN Unit 1 and Unit 2 non-Class 1 piping that is not part of the RCS pressure boundary was analyzed to meet ASME Section III due to modifications or reanalysis. Certain non-Class 1 heat exchangers were analyzed to ASME Section III and are reviewed in the following sections.

<u>Non-Class 1 Pressure Boundary Piping Using Stress Range Reduction Factors</u>

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 pipe stress calculations are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

<u>Non-Class 1 Piping with Fatigue Analysis</u>

The following piping locations that are not part of the RCS pressure boundary were reanalyzed to calculate cumulative usage factors per ASME Section III:

- Pressurizer relief piping downstream of the relief valves.
- Feedwater thermal sleeves liners and elbows.

The pressurizer relief piping reanalysis included calculating a usage factor for portions of the relief piping.

The feedwater thermal sleeves, located just upstream of the steam generators, were installed in all four Unit 1 feedwater lines and in the Unit 2 feedwater lines for loops 2 and 3 due to concerns with cracking on the feedwater piping. As identified in UFSAR Table 3.2.1-2 sheet 5, the feedwater thermal sleeves are designed to ASME Section III Class B.

The Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the non-RCS pressure boundary piping with cumulative usage factors in accordance with 10 CFR 54.21(c)(1)(iii).

Non-Class 1 Heat Exchangers with Fatigue Analysis

The following non-Class 1 heat exchangers were analyzed to ASME Section III

- Residual heat removal (RHR) heat exchangers.
- Chemical and volume control system (CVCS) regenerative heat exchangers.

The RHR heat exchangers were evaluated for fatigue in a calculation by the vendor and determined to be exempt from a detailed fatigue analysis in accordance with ASME Section N-415-1. This exemption is based on cycles the heat exchangers would experience during 200 plant heatups and cooldowns. Since the plant cooldowns are tracked, the Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the RHR heat exchangers in accordance with 10 CFR 54.21(c)(1)(iii).

The CVCS regenerative heat exchangers were evaluated for fatigue in a calculation by the vendor and usage factors calculated for the piping, tubing, shell, and tubesheet. The analysis considered the following transients to bound the original 40 years of plant operation including 200 plant heatups and cooldowns:

(1) 2,000 step changes in letdown stream fluid temperature from 100°F to 560°F.

(2) 24,000 step changes in letdown stream fluid temperature from 400°F to 560°F.

(3) 200 changes in letdown stream fluid temperature from 100°F to 560°F occurring over four hours.

(4) 200 changes in letdown stream fluid temperature from 560°F to 140°F occurring over 20 hours.

(5) 200 pressurizations to respective design pressure and temperature.

The resulting total cumulative usage factors for all of these transients were very low as shown in the following table:

Location	Usage Factor (CUF)
Piping	0.03
Tubing	0.01
Shell	0.13
Tubesheet	0.03

These low usage factors indicates the cycles could be increased if necessary. The step changes in temperature actually occur at a very low rate, and therefore, the step change cycles need not be tracked. Since the plant cooldowns are tracked, the Fatigue Monitoring Program (Section A.1.11) will manage the effects of aging due to fatigue on the CVCS 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/CR-6260 addresses the application of environmental factors to fatigue analyses (CUFs) and identifies locations of interest for consideration of environmental effects. Section 5.5 of NUREG/CR-6260 identified the following component locations to be the most sensitive to environmental effects for SQN vintage Westinghouse plants. These locations and the subsequent calculations are directly relevant to SQN.

(1) Reactor vessel shell and lower head.

(2) Reactor vessel inlet and outlet nozzles.

(3) Pressurizer surge line (including hot leg and pressurizer nozzles).

(4) Reactor coolant piping charging system nozzle.

(5) Reactor coolant piping safety injection nozzle.

(6) Residual heat removal (RHR) system Class 1 piping.

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 environmental correction factor is not required during the initial 40 years of operation, consistent with the closure of Generic Safety Issue (GSI) 190.

As identified in the enhancement to the Fatigue Monitoring Program (Section A.1.11), prior to the period of extended operation, SQN 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. 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). SQN 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.

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). If an acceptable CUF cannot be calculated, SQN will repair or replace the affected locations before exceeding an environmentally adjusted CUF of 1.0.

Therefore, SQN 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 specify a qualification of at least 40 years, but less than 60 years, are considered TLAAs for license renewal.

The SQN Environmental Qualification of Electric Components Program (SQN 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 SQN EQ Program ensures that the EQ components are maintained in accordance with their qualification bases.

The SQN EQ Program is an existing program established to meet SQN commitments for 10 CFR 50.49. The program is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components." The SQN 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 Fatigue of Primary Containment, Attached Piping, and Components

As described in UFSAR Section 3.8.2, the containment vessel for SQN is a low-leakage, free-standing steel structure consisting of a cylindrical wall, a hemispherical dome, and a bottom liner plate encased in concrete. UFSAR Figure 3.8.2-1 shows the outline and configuration of the containment vessel. The design of the containment vessel meets the requirements of the ASME Code, Section III, Winter Addenda 1968, applicable sections required for a Class B nuclear vessel, including Code cases 1177-5, 1290-1, 1330-1, 1413, and 1431. As described in UFSAR Section 3.8.2.5.1, shutdowns and startups do not occur with a frequency that required a design for fatigue failure, and therefore there is no TLAA for the SQN containment vessels.

Analyses were identified for bellows assemblies for the penetrations that stated they were qualified for 7000 cycles of the design displacements. The design displacements will occur much less than 7000 cycles. Therefore, the associated penetration bellows are qualified for the period of extended operation. The analysis remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.5 Other Plant-Specific TLAAs

A.2.5.1 Underclad Cracking Analysis

Reactor vessel underclad cracking involves cracks in base metal forgings immediately beneath austenitic stainless steel cladding which are created as a result of the weld-deposited cladding process. Westinghouse performed an analysis of flaw growth associated with underclad cracking in 1971 concluding that reactor vessel integrity could be assured for the entire 40-year original plant license term. Underclad cracking only requires analysis if examinations have detected flaws (the analysis is not used to postulate flaws). Indications that could be representative of underclad cracking flaws have been detected on both SQN Unit 1 and Unit 2; therefore, the underclad cracking analysis is considered a TLAA for SQN Unit 1 and Unit 2.

To extend this analysis to 60 years in support of license renewal, WCAP-15338-A, "A Review of Cracking Associated with Weld Deposited Cladding in Operating PWR Plants," provided an updated analysis of underclad cracking for Westinghouse units. This report examined the growth of underclad cracks in susceptible plants and showed that the crack growth would not threaten reactor vessel integrity through 60 years of plant operation. The NRC in their safety evaluation of this WCAP stated that any Westinghouse Owners Group plant may reference this report in a license renewal application to satisfy the requirements of 10CFR 54.21(c)(1) regarding evaluation of TLAAs for reactor vessel components. The safety evaluation specified the following two renewal applicant action items.

(1) Verify the plant is bounded by the WCAP-15338 report, specifically the number of cycles used in the analysis.

(2) Ensure the TLAA is identified in an FSAR supplement.

Transient cycles shown in WCAP-15338-A are equal to or greater than the number of design cycles for SQN Unit 1 and Unit 2. This UFSAR supplement satisfies the second requirement.

Therefore, this analysis has been projected per 10 CFR 54.21(c)(1)(ii).

A.2.5.2 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 SQN was performed to determine which cranes were designed to CMAA-70. The manipulator cranes at SQN Units 1 and 2 included CMAA-70 in their design specification. The lowest number of load cycles a crane is qualified for under CMAA-70 is 100,000 cycles. SQN determined that the number of lifts each manipulator crane would experience in 60 years with a 1.25 multiplier for margin is ~20,500. Therefore, the expected number of lifts is well below the qualification in CMAA-70, and the manipulator cranes TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

No other cranes at SQN were built to CMAA-70 requirements. Section 3.8.6 of the UFSAR provides descriptions of the cranes, and UFSAR Section 3.12 describes the control of heavy loads and the NUREG-0612 responses. The SQN responses to NUREG-0612 and the review of the site cranes identified that the reactor building polar crane and the auxiliary building crane were not built to the structural fatigue requirements of CMAA-70.

A.2.5.3 Leak-Before-Break Analysis

As described in UFSAR Section 3.6, the dynamic effects of double-ended postulated pipe ruptures in the reactor coolant loops have been eliminated from the SQN design basis by the application of leak-before-break (LBB) technology in accordance with the rule change to General Design Criterion 4. Authorization for their elimination is based on fracture mechanics analyses results performed by Westinghouse.

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 SQN.

<u>Thermal Aging of CASS</u>

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. Fully aged, bounding fracture toughness values were used in the evaluation for the cast fittings. As the LBB evaluations for both units 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 considered 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 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. For SQN Unit 1 and Unit 2, no transient is projected to exceed the number of analyzed cycles prior to the end of the period of extended operation. Therefore, the LBB TLAA remains valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.3 REFERENCES

A.3-1 [SQN License Renewal Application—later]

A.3-2 [NRC Safety Evaluation Report for SQN License Renewal—later]

Appendix B

Aging Management Programs and Activities

Sequoyah Nuclear Plant
License Renewal Application

TABLE OF CONTENTS

B.0 INTRODUCTION

B.0.1 OVERVIEW

The aging management review results for the integrated plant assessment of Sequoyah Nuclear Plant (SQN) 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 described in this appendix has ten elements in accordance with the guidance 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 ten elements have been compared to the elements of the NUREG-1801 program. For plant-specific programs that do not correlate with NUREG-1801, the ten elements are addressed 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 degree of consistency between the SQN program and the corresponding NUREG-1801 program, when applicable (i.e., degree of similarity, etc.).
- **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 discussion of the ten elements of NUREG-1800, Table A.1-1, is provided.

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 necessary and is not included in the descriptions of the individual programs.

Corrective Actions

SQN 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 SQN (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities during the period of extended operation.

Confirmation Process

SQN QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The SQN Quality Assurance Program applies to SQN safety-related and important-to-safety 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 SQN Corrective Action Program (CAP) and document control program. The confirmation process is part of the CAP 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 CAP. The CAP constitutes the confirmation process for aging management programs and activities. The SQN confirmation process is consistent with NUREG-1801.

Administrative Controls

SQN QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The SQN Quality Assurance Program applies to SQN 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 SQN 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 as required by the program. 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 captured and systematically reviewed on an ongoing basis in accordance with the quality assurance program, which meets the requirements of 10 CFR Part 50, Appendix B, and the operating experience program, which meets the requirements of NUREG-0737, Item I.C.5, "Procedures for Feedback of Operating Experience to Plant Staff." 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, incoming operating experience items are screened to determine whether they may involve age-related degradation or impact to aging management programs (AMPs).

Items are evaluated, and affected AMPs are either enhanced or new AMPs are developed, as appropriate, when it is determined through these evaluations that the effects of aging are not adequately managed.

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.

Plant-specific operating experience associated with aging management and age-related degradation is reported to the industry in accordance with guidelines established in the operating experience program.

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 SQN programs is shown in Table B-2.

Table B-1
Aging Management Programs

Program	Section	New or Existing
Aboveground Metallic Tanks	B.1.1	New
Bolting Integrity	B.1.2	Existing
Boric Acid Corrosion	B.1.3	Existing
Buried and Underground Piping and Tanks Inspection	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
Flux Thimble Tube Inspection	B.1.15	Existing
Inservice Inspection	B.1.16	Existing
Inservice Inspection – IWF	B.1.17	Existing
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B.1.18	Existing

Table B-1 (Continued)
Aging Management Programs

Program	Section	New or Existing
Internal Surfaces in Miscellaneous Piping and Ducting Components	B.1.19	New
Masonry Wall	B.1.20	Existing
Metal Enclosed Bus Inspection	B.1.21	New
Neutron-Absorbing Material Monitoring	B.1.22	Existing
Nickel Alloy Inspection	B.1.23	Existing
Non-EQ Cable Connections	B.1.24	New
Non-EQ Inaccessible Power Cable (400 V to 35 kV)	B.1.25	New
Non-EQ Instrumentation Circuits Test Review	B.1.26	New
Non-EQ Insulated Cables and Connections	B.1.27	New
Oil Analysis	B.1.28	Existing
One-Time Inspection	B.1.29	New
One-Time Inspection – Small-Bore Piping	B.1.30	New
Periodic Surveillance and Preventive Maintenance	B.1.31	Existing
Protective Coating Monitoring and Maintenance	B.1.32	Existing
Reactor Head Closure Studs	B.1.33	Existing
Reactor Vessel Internals	B.1.34	Existing
Reactor Vessel Surveillance	B.1.35	Existing
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	B.1.36	Existing
Selective Leaching	B.1.37	New
Service Water Integrity	B.1.38	Existing
Steam Generator Integrity	B.1.39	Existing

Table B-1 (Continued)
Aging Management Programs

Program	Section	New or Existing
Structures Monitoring	B.1.40	Existing
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	B.1.41	New
Water Chemistry Control – Closed Treated Water Systems	B.1.42	Existing
Water Chemistry Control – Primary and Secondary	B.1.43	Existing

B.0.6 CORRELATION WITH NUREG-1801 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 programs and SQN programs is shown below. For the SQN programs, links to appropriate sections of this appendix are provided.

Table B-2
SQN AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	SQN 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	SQN 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.1.16]
XI.M2	Water Chemistry	Water Chemistry Control – Primary and Secondary [B.1.43]
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Studs [B.1.33]

Table B-2 (Continued)
SQN AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	SQN Program
XI.M4	BWR Vessel ID [Inside Diameter] Attachment Welds	SQN is a PWR. This NUREG-1801 program does not apply.
XI.M5	BWR Feedwater Nozzle	SQN is a PWR. This NUREG-1801 program does not apply.
XI.M6	BWR Control Rod Drive Return Line Nozzle	SQN is a PWR. This NUREG-1801 program does not apply.
XI.M7	BWR Stress Corrosion Cracking	SQN is a PWR. This NUREG-1801 program does not apply.
XI.M8	BWR Penetrations	SQN is a PWR. This NUREG-1801 program does not apply.
XI.M9	BWR Vessel Internals	SQN is a PWR. This NUREG-1801 program does not apply.
XI.M10	Boric Acid Corrosion	Boric Acid Corrosion [B.1.3]
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.1.23]
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) [B.1.41]
XI.M16A	PWR Vessel Internals	Reactor Vessel Internals [B.1.34].
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion [B.1.14]
XI.M18	Bolting Integrity	Bolting Integrity [B.1.2]
XI.M19	Steam Generators	Steam Generator Integrity [B.1.39]
XI.M20	Open-Cycle Cooling Water System	Service Water Integrity [B.1.38]

Table B-2 (Continued)
SQN AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	SQN Program
XI.M21A	Closed Treated Water Systems	Water Chemistry Control – Closed Treated Water Systems [B.1.42]
XI.M22	Boraflex Monitoring	SQN does not utilize Boraflex in the spent fuel pool. 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.1.18].
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring [B.1.5]
XI.M25	BWR Reactor Water Cleanup System	SQN is a PWR. This NUREG-1801 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	Aboveground Metallic Tanks [B.1.1]
XI.M30	Fuel Oil Chemistry	Diesel Fuel Monitoring [B.1.8]
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance [B.1.35]
XI.M32	One-Time Inspection	One-Time Inspection [B.1.29]
XI.M33	Selective Leaching	Selective Leaching [B.1.37]
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection – Small-Bore Piping [B.1.30]
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring [B.1.10]
XI.M37	Flux Thimble Tube Inspection	Flux Thimble Tube Inspection [B.1.15]
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Internal Surfaces in Miscellaneous Piping and Ducting Components [B.1.19]

Table B-2 (Continued)
SQN AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	SQN Program
XI.M39	Lubricating Oil Analysis	Oil Analysis [B.1.28]
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex	Neutron-Absorbing Material Monitoring [B.1.22]
XI.M41	Buried and Underground Piping and Tanks	Buried and Underground Piping and Tanks Inspection [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.1.27]
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 Instrumentation Circuits Test Review [B.1.26]
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Power Cables (400 V to 35 kV) [B.1.25]
XI.E4	Metal Enclosed Bus	Metal Enclosed Bus Inspection [B.1.21]
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 Cable Connections [B.1.24]
XI.S1	ASME Section XI, Subsection IWE	Containment Inservice Inspection – IWE [B.1.6]

Table B-2 (Continued)
SQN AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	SQN Program
XI.S2	ASME Section XI, Subsection IWL	The only portion of SQN's 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). SQN does not have a concrete containment that requires an IWL program.
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection – IWF [B.1.17]
XI.S4	10 CFR 50, Appendix J	Containment Leak Rate [B.1.7]
XI.S5	Masonry Walls	Masonry Wall [B.1.20]
XI.S6	Structures Monitoring	Structures Monitoring [B.1.40]
XI.S7	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants [B.1.36]
XI.S8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program [B.1.32]
Plant-Specific Program		
NA	Plant-specific program	Periodic Surveillance and Preventive Maintenance [B.1.31]

Table B-3 indicates the consistency of SQN programs with NUREG-1801 programs.

Table B-3
SQN Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Program has Enhancements	Program has Exceptions to NUREG-1801
Aboveground Metallic Tanks		X		
Bolting Integrity		X	X	
Boric Acid Corrosion		X		
Buried and Underground Piping and Tanks Inspection		X		
Compressed Air Monitoring		X	X	
Containment Inservice Inspection – IWE		X		
Containment Leak Rate		X		
Diesel Fuel Monitoring		X	X	
Environmental Qualification (EQ) of Electric Components		X		
External Surfaces Monitoring		X	X	
Fatigue Monitoring		X	X	
Fire Protection		X	X	
Fire Water System		X	X	
Flow-Accelerated Corrosion		X	X	
Flux Thimble Tube Inspection		X	X	
Inservice Inspection		X		
Inservice Inspection – IWF		X	X	

Table B-3 (Continued)
SQN Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Program has Enhancements	Program has Exceptions to NUREG-1801
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems		X	X	
Internal Surfaces in Miscellaneous Piping and Ducting Components		X		
Masonry Wall		X	X	
Metal Enclosed Bus Inspection		X		
Neutron-Absorbing Material Monitoring		X	X	
Nickel Alloy Inspection		X		
Non-EQ Cable Connections		X		
Non-EQ Inaccessible Power Cables (400 V to 35 kV)		X		
Non-EQ Instrumentation Circuits Test Review		X		
Non-EQ Insulated Cables and Connections		X		
Oil Analysis		X	X	
One-Time Inspection		X		
One-Time Inspection – Small-Bore Piping		X		
Periodic Surveillance and Preventive Maintenance	X			

Table B-3 (Continued)
SQN Program Consistency with NUREG-1801

Program Name	Plant-Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Program has Enhancements	Program has Exceptions to NUREG-1801
Protective Coating Monitoring and Maintenance		X	X	
Reactor Head Closure Studs		X	X	
Reactor Vessel Internals		X	X	
Reactor Vessel Surveillance		X	X	
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants		X	X	
Selective Leaching		X		
Service Water Integrity		X		
Steam Generator Integrity		X	X	
Structures Monitoring		X	X	
Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)		X		
Water Chemistry Control – Closed Treated Water Systems		X	X	
Water Chemistry Control – Primary and Secondary		X		

B.1 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

B.1.1 ABOVEGROUND METALLIC TANKS

Program Description

The Aboveground Metallic Tanks Program is a new program that will manage loss of material and cracking for the outer surfaces of the aboveground metallic tanks using periodic visual inspections on tanks within the scope of the program as delineated in 10 CFR 54.4. Preventive measures were applied during construction, such as using the appropriate materials, protective coatings, and elevation as specified in design and installation specifications. For in-scope painted tanks, the program monitors the surface condition for blistering, flaking, cracking, peeling, discoloration, underlying rust, and physical damage. For in-scope stainless steel tanks, the program will monitor surface condition to assure a clean, shiny surface with no visible leaks. The visible exterior portions of the tanks will be inspected at least once every refueling cycle.

This program will also manage the bottom surface of aboveground metallic tanks, which are constructed on a ring of concrete and oil-filled sand. The program will require ultrasonic testing (UT) of the tank bottoms to assess the thickness against the thickness specified in the design specification. The UT testing of the tank bottoms will be performed at least once within the five years prior to the period of extended operation and whenever the tanks are drained during the period of extended operation.

In accordance with installation and design specifications, the tanks do not employ caulking or sealant at the concrete/tank interface.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Aboveground Metallic Tanks Program will be consistent with the program described in NUREG-1801, Section XI.M29, Aboveground Metallic Tanks.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Aboveground Metallic Tanks 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

As discussed in element 10 to NUREG-1801, Section XI.M29, this program considers the technical information and industry operating experience provided in NRC Generic Letter (GL) 98-04, NRC IN 89-79; IN 89-79, Supplement 1; IN 86-99; and IN 86-99, Supplement 1.

The review of operating experience at SQN concluded that no age-related degradation that threatened the intended function of these tanks has occurred at SQN, and no aging mechanisms not considered in NUREG-1801 have been identified. The visual inspection and thickness measurement methods used in this program to detect aging effects are proven industry techniques that have been effectively used at SQN in other programs. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 Aboveground Metallic Tanks Program will be effective at identifying and managing the aging effects of loss of material and cracking on the outer surfaces of the in-scope tanks, since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Aboveground Metallic Tanks 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 BOLTING INTEGRITY

Program Description

The Bolting Integrity Program manages loss of preload, cracking, and loss of material for closure bolting for safety-related and nonsafety-related pressure-retaining components using preventive and inspection activities. This program does not include the reactor head closure studs or structural bolting. Preventive measures include material selection (e.g., use of materials with an actual yield strength of less than 150 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. Inspection activities include those required by ASME Section XI for ASME Class 1, 2 and 3 pressure-retaining components. For non-ASME Code class bolts, periodic system walkdowns and inspections (at least once per refueling cycle) ensure identification of indications of loss of preload (leakage), cracking, and loss of material before leakage becomes excessive. With the exception of one reactor vessel closure stud, which is managed by the Reactor Head Closure Studs Program (Section B.1.33), no high-strength bolting has been identified at SQN. Identified leaking bolted connections will be monitored at an increased frequency in accordance with the corrective action process. Applicable industry standards and guidance documents, including NUREG-1339, EPRI NP-5769, and EPRI TR-104213, are used to delineate the program.

NUREG-1801 Consistency

The Bolting Integrity Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M18, Bolting Integrity.

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 Bolting Integrity Program procedures to ensure the actual yield strength of replacement or newly procured bolts will be less than 150 ksi.

Element Affected	Enhancement
7. Corrective Actions	Revise Bolting Integrity Program procedures to include the additional guidance and recommendations of EPRI NP-5769 for replacement of ASME pressure-retaining bolts and the guidance provided in EPRI TR-104213 for the replacement of other pressure-retaining bolts.

Operating Experience

An inspection of reactor coolant pump cartridge seal assembly bolting on Unit 2 in 2002 found indications of degradation of the nickel plating on a number of the bolts. The corrosion damage observed was very minimal and did not indicate aggressive boric acid attack. The corrosion was limited to the outer portion of the cap screw head with pitting not exceeding 1/32 inch. A review of the inservice inspection (ISI) history indicated that these cap screws had been replaced during the 1993 refueling outage for Unit 1 and the 1994 refueling outage for Unit 2. The affected bolts were replaced.

A 2003 inspection noted loss of material on the coupling bolts for the pump-bearing couplings (inboard and outboard) for both containment spray pumps on both units. Maintenance history was reviewed to find that only superficial corrosion deposits had been detected in the past with no degradation of the material. The subject bolts were cleaned under subsequent work orders, and a corrosion-inhibiting lubricant applied. This lubricant was found to be effective in inhibiting corrosion.

Bolting on a Unit 1 steam dump cool-down valve actuator housing was found to be loose in 2003 during completion of a calibration task. Personnel disassembled the actuator assembly and inspected the bolting. General corrosion due to external moisture was found, and the bolting was replaced.

During a 2004 walk-down of the ERCW pumping station, loss of material was observed on the bolting for valves and flanged connections where bimetallic materials were in contact with each other. Areas of corrosion were found at drain valves, in-line valves, chemical injection points, and other galvanic corrosion initiation points. A design change was implemented to replace carbon steel bolting with stainless steel bolting in flange connections for the ERCW system and in valve bolting for the hypochlorite system to alleviate the galvanic corrosion issue.

In 2006, flange bolting for a valve in the ERCW system was found with slight indications of corrosion. Maintenance personnel cleaned and repaired the bolting as necessary.

During a walk-down of the Unit 2 auxiliary feedwater system in 2009, a missing capscrew head was identified on an auxiliary feedwater pump stuffing box extension housing for the packing leakoff on the outboard side of the pump. Fourteen fasteners held the stuffing box extension housing to the pump casing, and thirteen remained intact. A failure analysis showed that the bolt failure was an isolated case. However, all of the bolts on the stuffing box were replaced.

A 2010 inspection of Unit 2 chemical and volume control system valve flanges found corrosion on nuts at the flange interface. A more in-depth inspection including photography showed only minor superficial surface rust that was localized at the nut-to-flange interface. The rust was not found to be indicative of material wastage or boric acid leakage. The structural adequacy of the nuts was unaffected.

In 2010, a review of operating experience from local craftsmen was used to improve the published guidance for bolted connections. "Snug tight" tensioning requirements contained in various design output and implementation documents were replaced with actual torque requirements. Allowable lubricants were more clearly specified. Requirements to achieve full thread engagement and the use of washers were clarified. Additional guidance was provided to help craftsmen in the field determine when the bolting must be replaced.

As discussed in element 10 to NUREG-1801, Section XI.M18, this program considers the technical information and industry operating experience provided in NRC IE Bulletin 82-02 and NRC GL 91-17.

The history of 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 Bolting Integrity Program will remain effective for managing loss of preload, cracking, and loss of material of components. 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 Bolting Integrity Program has been effective at identifying and managing the aging effects of loss of preload, cracking, and loss of material. The Bolting Integrity Program provides reasonable assurance that the effects of aging are 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 BORIC ACID CORROSION

Program Description

The Boric Acid Corrosion Program manages loss of material and increase in connection resistance for components on which borated reactor water may leak. The program consists of (a) visual inspection of external surfaces that are potentially exposed to borated water leakage, including mechanical, electrical and structural components; (b) timely discovery of leak path and removal of boric acid residues; (c) assessment of the damage; 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 ensure that corrosion caused by leaking borated coolant does not lead to degradation of the leakage source, adjacent structures, or electrical components and provides reasonable assurance that the reactor coolant pressure boundary will have an extremely low probability of abnormal leakage, rapidly propagating failure, or gross rupture. Visual inspections are performed for boric acid deposits, discoloration, staining, and moisture on insulated surfaces. If evidence of leakage is identified, insulation is required to be removed to determine the exact location and cause of the leakage. The Boric Acid Corrosion Program includes provisions for triggering evaluations and assessments when leakage is discovered by other activities (normal plant walkdowns, maintenance, etc.) to identify and correct boric acid leakage before loss of intended function of affected components. Corrective actions may include modifications to existing 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

In 2005, a new Boric Acid Corrosion Program procedure was issued to reflect the operating experience incorporated in WCAP-15988, Revision 1, "Generic Guidance for an Effective Boric Acid Inspection Program for Pressurized Water Reactors."

During final Unit 1 containment walk-down prior to containment closure in 2007, dry white boron was discovered on a valve stem, packing follower, and packing area. A review of previous history indicated that this component had been previously identified during the post-shutdown system leakage walk-down, had been cleaned under a work order, and had received tightening of the packing. In response to this finding, a new work order and a log entry were generated to track this potential problem for the next refueling outage.

In 2008, the program was enhanced to add requirements for follow-up monitoring and other enhancements based on recommendations from the 2008 Institute of Nuclear Power Operations (INPO) review visit.

A 2008 review of boric acid leakage evaluations noted that they did not consistently provide re-inspection intervals, identify expiration dates of evaluations, or require follow-up monitoring when work is deferred as required by procedure. In response, walk-downs of all current accessible leaks (wet and dry) were performed by systems and program engineers to determine status, with no indication of changes in original conditions noted. Procedures were revised to provide clarification concerning system walk-downs and boric acid leaks. Briefings were performed for system engineers and maintenance personnel regarding the rigor and expectations of reporting, assessing, and correcting boric acid leaks.

In 2008, it was noted that the scheduling review group was consistently rescheduling boric acid leakage work orders without taking into consideration the impacts on the Boric Acid Corrosion Program. A set of work orders had been generated as a result of a systems engineer walk-down in December of 2002, yet a boric acid walk-down of the subject components in 2008 indicated no change. In response to this observation, the engineering department began monitoring the area for changes in conditions using scheduled preventive maintenance tasks.

NRC inspections of the program were completed in June 2009 and again in December 2009. No findings of significance were identified.

In 2009, a QA assessment of the program noted that it met procedural requirements. Some areas for improvement were identified. The program was enhanced to specify a maximum seven-day window for cleaning and assessment of boron leaks and to specify time requirements for completion of engineering evaluations for identified cases of boric acid leakage.

The Boric Acid Corrosion Control (BACC) database is maintained per site procedure. This database contains information on leakage that has caused equipment degradation, as well as trend data on number of leaks identified, timeliness of corrective action, and other concerns. With this database, the use of operating experience from this program is maximized.

Upon entering the 2009 Unit 1 refueling outage, a valve known to have boric acid leaking through its threaded surface was investigated. However, based on the investigation and analysis, a decision could be made to defer the repair of the valve one refueling outage. The critical thinking upon which that decision was based was made possible by the data provided by this program. The valve in question has since been repaired.

Several examples of boric acid leak work orders were noted in 2011 to have not received a boric acid evaluation. In response, the mechanical shop manager was coached on submitting the evaluation forms.

A 2011 inspection of a Unit 2 containment spray pump outboard bearing housing found wet white boric acid buildup, while the inboard bearing housing was found to have dry white boric acid buildup. An engineering assessment and boron cleaning were completed and documented.

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 history of 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 Boric Acid Corrosion Program will remain effective for managing loss of material of components. 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 Boric Acid Corrosion Program has been effective at identifying and managing aging effects of loss of material and increase in connection resistance of the components subject to boric acid corrosion. The Boric Acid Corrosion Program provides reasonable assurance that the effects of aging are 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 BURIED AND UNDERGROUND PIPING AND TANKS INSPECTION

Program Description

The Buried and Underground Piping and Tanks Inspection Program is a new program that manages loss of material and cracking for the external surfaces of buried and underground piping fabricated from carbon steel and stainless steel through preventive measures (i.e., coatings, backfill, and compaction), mitigative measures (e.g., electrical isolation between piping and supports of dissimilar metals), and periodic inspection activities (i.e., direct visual inspection of external surfaces, protective coatings, wrappings, and quality of backfill) during opportunistic or directed excavations. There are no underground or buried tanks at SQN for which aging effects are managed by the Buried and Underground Piping and Tanks Inspection.

Cathodic protection is not installed. If cathodic protection is not provided prior to the period of extended operation, the program will include documented justification that cathodic protection is not warranted. The justification will include the results of soil testing (including tests for soil resistivity, corrosion-accelerating bacteria, pH, moisture, chlorides and redox potential) to demonstrate that the soil environment is not corrosive to applicable buried components. The results of a review of at least ten years of operating experience must support the conclusion that cathodic protection is not warranted. The review of ten years of operating experience will include review of operating experience with components not in the scope of license renewal if they are fabricated from the same materials and exposed to the same environments as in-scope buried and underground components.

If a reduction in the number of inspections recommended in Table 4a of NUREG-1801, Section XI.M41 is claimed based on a lack of soil corrosivity as determined by soil testing, then soil testing should be conducted once in each ten-year period starting ten years prior to the period of extended operation.

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.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Buried and Underground Piping and Tanks Inspection 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

In 2003, a leak was discovered in buried high pressure fire protection system piping in the transformer yard. A new pipe segment and couplings were installed, and the pipe was returned to service.

During a routine underground pressure test in 2008, a leak was discovered in a carbon steel buried pipe in the fuel oil system in the yard area near the diesel generator building. The pipe was repaired with weld overlays, scab plates and clam shells.

The review of operating experience at SQN concluded that no aging mechanisms not considered in NUREG-1801 XI.M41 have been identified. The Buried and Underground Piping and Tanks Inspection Program will be consistent with the program described in NUREG-1801, Revision 2, Section XI.M41, Buried and Underground Piping and Tanks. As stated in Section XI.M41, corrosion of buried oil, gas, and hazardous materials pipelines has been adequately managed through a combination of inspections and mitigative techniques, such as those prescribed in XI.M41. Accordingly, there is reasonable assurance that this new aging management program will be effective during the period of extended operation.

As discussed in element 10 to NUREG-1801, Section XI.M41, this program considers the industry operating experience described at six different industry locations.

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 will be effective in identifying and managing aging effects of loss of material and cracking on the external surfaces of buried and underground piping, since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. 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.1.5 COMPRESSED AIR MONITORING

Program Description

The Compressed Air Monitoring Program manages loss of material in compressed air systems by periodically monitoring air samples for moisture and contaminants and by opportunistically inspecting internal surfaces within compressed air systems. Air quality is maintained in accordance to limits established by considering manufacturer recommendations as well as industry recommendations in EPRI NP-7079, ASME OM-S/G-1998 (Part 17), and ISA-S7.0.1-1996. Inspection frequency, acceptance criteria, and design and operating reviews were performed in accordance with NRC GL 88-14 and SOER 88-01 to assist in the development of the Compressed Air Monitoring Program. In addition, the program was enhanced based on applicable industry standards and documents such as EPRI NP-7079, ASME OM-S/G-1998 (Part 17), and ISA-S7.0.1-1996 for guidance on preventive measures, inspection of components, and testing and monitoring air quality to ensure the in-scope compressed air systems and subsystems will be able to perform their intended function during the period of extended operation. Moisture sensors at the outlet of the auxiliary controlled air compressors continuously monitor in-line dew point with annunciation in the control room. Periodic internal visual inspections of critical components (compressors, dryers, after-coolers, filters, etc.) are performed for signs of corrosion. Air quality is monitored and 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 the Program	Revise Compressed Air Monitoring Program procedures to include the standby diesel generator (DG) starting air subsystem.
2. Preventive Actions	Revise Compressed Air Monitoring Program procedures to include maintaining moisture and other contaminants below specified limits in the standby DG starting air subsystem.

Element Affected	Enhancement
2. Preventive Actions	Revise Compressed Air Monitoring Program procedures to apply a 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.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Revise Compressed Air Monitoring Program procedures to maintain moisture, particulate size, and particulate quantity below acceptable limits in the standby DG starting air subsystem to mitigate loss of material.
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 surface conditions consistent with frequencies described in ASME OM-S/G-1998 (Part 17) of accessible internal surfaces such as compressors, dryers, after-coolers, and filter boxes of the following compressed air systems: • Diesel starting air subsystem • Auxiliary controlled air subsystem • Nonsafety-related controlled air subsystem
5. Monitoring and Trending	Revise Compressed Air Monitoring Program procedures to monitor and trend moisture content in the standby DG starting air subsystem.
6. Acceptance Criteria	Revise Compressed Air Monitoring Program procedures to include consideration of the guidance for acceptance criteria in ASME OM-S/G-1998 (Part 17), EPRI NP-7079, and EPRI TR-108147.

Operating Experience

In 2010, an assessment of the instrument air system quality was performed with respect to the recommendations of SOER 88-01, "Instrument Air System Failures." As a result, the following program improvements were implemented.

- Changed the air quality testing procedure (e.g., changed the maximum dew point at line pressure acceptance criteria in the turbine building controlled air quality test and the auxiliary building controlled air quality test procedures).
- Changed the auxiliary building controlled air quality test procedure to include testing for hydrocarbons.
- Changed the turbine building controlled air quality test and the auxiliary building controlled air quality test procedures to include testing for corrosive contaminants.

Subsequent discussions with engineering revealed that corrosive contaminants would only be detected if the air systems were recently exposed to corrosive contaminants through the air compressor intakes; therefore, testing for corrosive contaminants would not necessarily enhance the program if conducted on a scheduled basis. A more effective measure was to frequently check for strong odors near the air compressors, which would indicate that potentially corrosive fumes are being drawn into the air systems. The assistant unit operators (AUOs) already perform this check during daily routines. Six AUOs were independently questioned regarding responsibilities for checking for strong odors near control and service air compressor intakes. Each AUO confirmed that this check is part of the daily walk-down responsibilities. The shift manager is immediately notified if strong odors are detected.

- Revised the criteria for providing statistical assurance on the particle size evaluation, including precautions for avoiding external contamination.

No operating experience with degraded conditions of air system piping due to internal environment conditions was identified.

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; INPO SOER 88-01; EPRI NP-7079; and EPRI TR-108147.

The history of 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 Compressed Air Monitoring Program will remain effective for managing loss of material of components. 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.

<u>Conclusion</u>

The Compressed Air Monitoring Program has been effective at identifying and managing the aging effect of loss of material on the internal surfaces of compressed air systems. The Compressed Air Monitoring Program provides reasonable assurance that the effects of aging are 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 SQN containment design is a low-leakage, free-standing steel containment founded on the circular concrete foundation slab of the shield building. The portion of SQN's containment that is classified as Class CC equivalent is the circular concrete foundation slab of the shield building. The bottom steel liner plate of the steel containment vessel was erected on top of the circular concrete foundation slab with a two-foot thick concrete slab poured on top of the liner plate. Since the Class CC equivalent concrete foundation slab and the bottom steel liner plate are inaccessible, they are exempted from examination in accordance with IWL-1220(b) and IWE-1220(b). There are no tendons associated with SQN's steel containment vessel. The code of record for the examination of the SQN containment, 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 SQN CII-IWE Program includes the free-standing steel containment vessel and its integral attachments, containment hatches, airlocks, moisture barriers, and pressure-retaining bolting. The program performs visual examinations (general visual, VT-1 and VT-3), including examination of bellows as described in NRC IN 92-20, 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 steel containment vessel surface areas including welds and base metal and containment vessel integral attachments, metal liner, 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 exceeds the acceptance criteria.

SQN Unit 1 and Unit 2 are pressurized water reactors. Therefore, the aging management activities of LR-ISG-2006-01 for a boiling water reactor Mark I steel containment drywell shell are not applicable.

The CII-IWE Program is augmented by plant procedures that use the guidance of EPRI TR-104213, NUREG-1339, and EPRI NP-5769 to ensure proper specification of bolting material, lubricant and sealants, and installation torque.

NUREG-1801 Consistency

The Containment Inservice Inspection – IWE Program is consistent with the program described in NUREG-1801, Section XI.S1, ASME Section XI, Subsection IWE.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

An assessment of the notification of indication reporting for the IWE program was performed in June 2006. The information required by 10 CFR 50.55a was found to be provided in the ISI summary report. Several editorial changes were recommended and were incorporated by the ISI program specialist.

An assessment of the ISI Summary Report Appendix D, "IWE Metal Containment Evaluations," was performed in February 2007. This was found to be complete and met the applicable program and regulatory requirements.

An assessment of the IWE scan plan for the SQN Unit 1 refueling outage was performed in September 2007 to check for compliance with program requirements. This assessment found that the plan met applicable program and regulatory requirements.

An assessment of the IWE scan plan for the SQN Unit 2 refueling outage was performed in April 2008 to check for compliance with program requirements. This assessment found that the plan met applicable program and regulatory requirements.

For examinations performed during the Unit 1 refueling outage in April 2009, no degraded conditions were identified in accessible portions of the containment vessel which would require additional examinations or evaluation of inaccessible areas. The entire exterior surface was examined. The examinations identified minor surface indications on the exterior surface areas. Indications noted were areas of rust, unpainted areas, scrapes and dings, chipping hammer marks, pipe clamp marks, arc strikes, and a gouge with no visible signs of active corrosion. A gouge of noted 1/16 inch depth was evaluated by engineering and found acceptable. No detrimental flaws were observed.

The class MC examinations performed during the Unit 2 refueling outage in November 2009 did not identify degradation in accessible portions of the containment vessel that would require additional examinations or evaluation of inaccessible areas.

During containment ISI general visual examinations performed during the Unit 1 refueling outage in October 2010, no detrimental flaws were observed that would impact the structural integrity or leak tightness of the containment vessel. The entire interior surface was examined. The examinations identified minor surface indications on the interior surfaces. Indications noted were areas of minor rust, scrapes and dings, arc strikes, and minor coating damage with no visible signs of active corrosion.

In 2011, the program was enhanced to require inspection of the containment vessel moisture barrier in accordance with industry standards based on operating experience. Also in 2011, the program was revised to change the scope of examinations performed on the containment vessel dome cut welds, based on operating experience.

During containment ISI general visual examinations performed during the Unit 2 refueling outage in June 2011, no detrimental flaws or significant degradation of the containment vessel was identified. Examination reports document the visual examinations of the inboard and outboard portions of the containment vessel at all accessible locations. In general, the examination identified indications consisting mostly of light rust, discoloration, scratches, or localized areas of flaking/blistering/missing paint. These areas contained no detrimental flaws or significant degradation of the containment vessel. In addition, several localized pits were reported. All of the pits were painted over, likely during original construction, leaving no exposed metal and no rust. Supplemental pit depth measurements were taken to support the engineering evaluation of these indications. These SCV areas are not considered suspect and do not impact the structural integrity or leak tightness of the SCV.

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, operating experience shows that 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. This information is not directly relevant to SQN since the containment vessels are free-standing units and not concrete containments with steel liner plates. However, SQN has augmented the IWE program to emphasize the inspection of the steel shell at the concrete floor embedment and inaccessible portions (behind mechanical equipment) of the shell.

As discussed in element 10 to NUREG-1801, Section XI.S1, this program considers the technical information and industry operating experience provided in NRC IN 86-99, IN 88-82, IN 89-79, IN 2004-09, and NUREG-1522.

The history of 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 Containment Inservice Inspection – IWE Program will remain effective for managing loss of material of the containment vessel. 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 Containment Inservice Inspection – IWE Program has been effective at identifying and managing the aging effects of loss of sealing of elastomeric components and loss of material, cracking, and loss of leak tightness of the ASME Code Class MC pressure-retaining steel components and their integral attachments. The Containment Inservice Inspection – IWE Program provides reasonable assurance that the effects of aging are 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.1.7 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; Regulatory Guide 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. 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 other refueling outages before the next Type A test if the interval for the Type A test has been extended to ten years. The ILRT is performed at the frequency specified in accordance with 10 CFR Part 50, Appendix J, Option B. Type B containment leakage rate tests (LRT) are intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary of containment penetrations. Type C tests are intended to detect local leaks and to measure leakage across containment isolation valves installed in containment penetrations or lines penetrating containment. If Type C tests are not performed under this program, they can be included under an ASME Code, Section XI, Inservice Test Program leakage testing for systems containing the isolation valves. Local leakage rate tests (LLRT) are performed at frequencies that comply with the requirements 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 meet the requirements of 10 CFR Part 50, Appendix J, Option B and are part of the current licensing basis as defined in the plant's Technical Specifications.

The SQN Containment Leak Rate Program does not prevent degradation due to aging effects but provides measures for condition monitoring to detect the degradation prior to loss of intended function. The Containment Leak Rate Program detects degradation of the containment shell and liner 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 the additional implementation of an acceptable 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 requirements and guidance provided in 10 CFR Part 50, Appendix J, Option B. The Containment Leak Rate Program demonstrates that the test results meet the requirements contained in the acceptance criteria. Test results that fail to meet the acceptance criteria defined in the plant Technical Specifications are reported in accordance with approved procedures that meet the requirements of 10 CFR 50.72 and 10 CFR 50.73.

Evaluations are performed for test or inspection results that do not satisfy established criteria and a problem evaluation report (PER) is initiated to document the issue in accordance with plant administrative procedures.

The 10 CFR Part 50, Appendix B CAP ensures that the conditions adverse to quality are promptly corrected. If the deficiency is assessed to be significantly adverse to quality, the cause of the condition is determined and an action plan is developed to prevent recurrence. 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

A 2005 assessment of the program found it to be in compliance with the Technical Specifications, UFSAR, Regulatory Guide 1.163, NEI 94-01, and ANSI 56.8 1994 requirements. No findings were identified.

"As Found" local leakage rate test (LLRT) failures were documented for valves during the Unit 2 refueling outage in 2005. Work orders were written to perform repairs or replacements or engineering evaluations as necessary. The causes were considered to be isolated to specific components due to normal wear or system contamination. Five of the components were first-time failures, while three were repeat failures from the 2003 Unit 2 refueling outage. All of the components were reworked and returned to service, except one (X-128E) that could not be repaired. The replacement of X-128E was deferred to a future Unit 2 refueling outage.

In 2006, a program assessment was performed by an offsite evaluator. The program was found in compliance with the NRC regulations applicable to the Appendix J program. The assessment noted that the SQN program provisions exceeded NRC requirements in several areas.

An engineering functional area audit in 2006 found the program acceptable with no identified issues.

During the Unit 1 refueling outage in 2006, four valves and an electrical penetration exceeded their LLRT administrative limits. The valves were repaired during the outage, but the electrical penetration was replaced during the next Unit 1 refueling outage.

During the Unit 2 refueling outage in 2006, several components exceeded their "as found" LLRT administrative leakage limits. All of the components except the electrical penetration X-128E were reworked, and the as-left LLRT post-maintenance test passed with leakage well below the administrative leakage limits. The replacement of X-128E was deferred to the next Unit 2 refueling outage.

Summaries of the results for the Type A tests conducted to measure the containment system overall integrated leakage rate for Unit 1 (October 2007) and Unit 2 (December 2006) are described below.

- Unit 1 integrated leakage rate test (ILRT) results: The Type A test began on October 27, 2007, and the measured leakage rate was greater than 0.75La. A leak was discovered on a penetration and was repaired. The Type A test was restarted and the test period concluded after 8 hours. The final leak rate was well below both La and 0.75La.

- Unit 2 ILRT results: The Type A test began on December 20, 2006, and the test period concluded after 8 hours. The final leak rate was well below 0.75La.

The general visual examinations of the accessible containment interior and exterior surfaces prior to the ILRTs for Unit 1 (October 2007) and Unit 2 (December 2006) revealed the conditions described below. There were no findings to indicate any structural deterioration or leak tightness degradation of the steel containment vessels.

- Unit 1 interior surfaces: The examinations revealed minor conditions such as scratches and flaking coatings.

- Unit 1 exterior surfaces: The examinations revealed minor corrosion, rusting, and pitting, with no visible signs of active corrosion. The areas examined did not show any significant wall loss or gross degradation.

- Unit 2 interior surfaces: The examinations revealed minor conditions such as light corrosion and flaking coatings.
- Unit 2 exterior surfaces: The examinations revealed minor corrosion, light rusting, and pitting.

In 2008, industry operating experience published by the BWR Owners' Group in response to NRC GL 89-10 was incorporated into the SQN guidelines for Appendix J valve retest requirements. Guidelines on mitigation of individual local leak rate test administrative limits with respect to entry into associated limiting conditions for operation (LCOs) were incorporated.

In 2008, an engineering functional area audit team performing a review of the Containment Leak Rate Testing Program concluded that the program was effective and identified no audit issues.

In 2008, during the performance of a Unit 2 test, it was discovered that a valve exceeded the LLRT administrative leakage limit. Maintenance personnel reworked the valve and the upper airlock door. The electrical penetration X-128E was replaced.

During the Unit 2 refueling outage in 2009, eight components exceeded their administrative leakage limit. Work orders were performed to repair, rework, or replace these components.

During the Unit 1 refueling outage in 2009, three components exceeded their administrative leakage limit. Work orders were performed to repair, rework, or replace these components.

An engineering programs audit in 2010 reviewed data packages associated with testing for containment leakage, and one deficiency was identified. This deficiency identified that the temperature indicator selected for an in-process performance of an LLRT was outside of the accuracy specified in the test procedure. A post-use calibration of the temperature indicator was performed, and the accuracy was found acceptable.

As discussed in element 10 to NUREG-1801, Section XI.S4, this program has been effective throughout the industry in preventing unacceptable leakage through the containment pressure boundary.

The history of 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 Containment Leak Rate Program will remain effective for managing loss of material of containment pressure boundary components. 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 Containment Leak Rate Program has been effective at identifying and managing the aging effects of loss of sealing of elastomeric components and loss of material, cracking and loss of leak tightness of the ASME Code Class MC pressure retaining steel components and their integral attachments. The Containment Leak Rate Program provides reasonable assurance that the effects of aging are 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 in piping, tanks, and other components exposed to an environment of diesel fuel oil by verifying quality of the fuel oil source. This is performed by receipt inspection before allowing it to enter the fuel oil storage tanks. Parameters monitored include water, sediment, total particulate, and levels of microbiological activity. Where possible, the program requires 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 water is identified, biocides are added to prevent biological activity.

The fuel oil program confirms the effectiveness of the program by periodically inspecting low flow areas where contaminates may collect, such as in the bottom of tanks. The tanks are periodically sampled, drained, cleaned, and internally inspected for signs of moisture, contaminants, and corrosion. Internal tank inspections will be performed at least once during the ten-year period prior to the period of extended operation and at least once every ten years during the period of extended operation. Where degradation is observed, a wall thickness determination will be made, and the extent of the condition is verified as a part of the CAP. The design and installation specifications for the in-scope fuel oil storage tanks do not require internal coating. Applicable industry standards and guidance documents are used to establish inspection frequency. Water, biological activity, and particulate contamination acceptance criteria for fuel oil quality parameters are specified in the SQN technical specifications.

The One-Time Inspection Program (Section B.1.29) describes inspections planned 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
3. Parameters Monitored or Inspected 5. Monitoring and Trending	Revise Diesel Fuel Monitoring Program procedures to monitor and trend sediment and particulates in the standby DG day tanks.
3. Parameters Monitored or Inspected 5. Monitoring and Trending	Revise Diesel Fuel Monitoring Program procedures to monitor and trend levels of microbiological organisms in the seven-day storage tanks.
4. Detection of Aging Effects	Revise Diesel Fuel Monitoring Program procedures to include a ten-year periodic cleaning and internal visual inspection of the standby DG diesel fuel oil day tanks and high pressure fire protection (HPFP) diesel fuel oil storage tank. These cleanings and internal inspections will be performed at least once during the ten-year period prior to the period of extended operation and at succeeding ten-year intervals. If visual inspection is not possible, a volumetric inspection will be performed.
4. Detection of Aging Effects	Revise Diesel Fuel Monitoring Program procedures to include a volumetric examination of affected areas of the diesel fuel oil tanks, if evidence of degradation is observed during visual inspection. The scope of this enhancement includes the standby DG seven-day fuel oil storage tanks, standby DG fuel oil day tanks, and HPFP diesel fuel oil storage tank and is applicable to the inspections performed during the ten-year period prior to the period of extended operation and succeeding ten-year intervals.

Operating Experience

In 2009, a sample of the Unit 2 diesel seven-day tank #1 was found to have particulates above the administrative goal but below the technical specification limit. The tank was resampled and results were within the limits. This particulate data was added to trend data.

NRC IN 2009-02 alerts licensees to the potential for diesel fuel oil to contain up to five percent biodiesel, which could adversely impact engine performance. This IN was used to enhance the SQN program. SQN has now changed procedures to support testing for biodiesel.

An assessment of diesel fuel testing performed in 2010 found the program was sound and meeting industry requirements. The assessment identified two areas for improvement. One was related to clarifying the use of ASTM revisions (primarily ASTM D975). The other was related to formally specifying the use of lubricity testing and biodiesel testing as a quality control analysis. There were differences in ASTM revisions referenced by the testing lab and the Licensing department. Procedures were revised to resolve the differences.

An assessment of diesel fuel tank water removal procedures and tank cleaning standards at SQN was performed in 2010. No discrepancies were noted.

In 2010, industry operating experience from ASTM D7371 concerning biodiesel was incorporated into the SQN procedure for diesel fuel qualification. SQN procedures were revised to accept no biodiesel.

An engineering programs audit in 2010 included a review of implementation of the diesel fuel oil program. Surveillance data packages were reviewed for the two surveillance instructions (SIs) performed for this program by chemistry. Two deficiencies were identified. The first deficiency was that the chemistry SI for measuring fuel oil particulate specified a 1994 version of ASTM standard 2276 for testing in accordance with the SQN Technical Specification bases. The testing procedure used by TVA Central Laboratory Services made reference to the 1989 version of this standard and did not refer to the 1994 version of the standard as the basis for the test. The second deficiency identified a difference between the acceptance criteria for fuel oil flash point and distillation temperature compared to the ASTM standard values. A review of the test performance data identified that the actual data points were well above the acceptance criteria so the difference with respect to the ASTM standard had no impact. These issues were resolved in the CAP.

In 2010, procedures were revised to clarify timeliness requirements for the water check of fuel oil following DG operation.

A 2010 self-assessment concluded testing is required to prevent acceptance of biodiesel on site. Central Laboratory Services has started sending a monthly sample off site for this test and has purchased a machine to perform the test in house. Site procedures were revised to include guidance for this test.

The history of 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 Diesel Fuel Monitoring 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 Diesel Fuel Monitoring Program has been effective at identifying and managing the aging effect of loss of material of the interior surfaces of components exposed to diesel fuel oil. The Diesel Fuel Monitoring Program provides reasonable assurance that the effects of aging are 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 Nuclear Regulatory Commission (NRC) has established nuclear station environmental qualification (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.

EQ Component Reanalysis Attributes

The reanalysis of an aging evaluation is normally 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, including 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 current qualification remains valid. A reanalysis is to be performed in a timely manner (that is, sufficient time is available to refurbish, replace, or requalify the component if 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

In 2006, industry operating experience provided in NRC IN 2006-14 was evaluated for SQN. A replacement for the internal seals used in Barton pressure transmitters was selected, analyzed, and introduced for use.

A program assessment in 2008 included the following elements.

- A review of design change notices (DCNs) was performed to ensure that 10 CFR 50.49 impacts are correctly identified, documented, and resolved. All DCNs reviewed were adequate and met procedural requirements.
- Environmental qualification binders were reviewed to ensure that procedural requirements are met and that all documentation accurately implements 10 CFR 50.49 requirements. Twenty-four binders were reviewed, and all were found to be technically adequate "stand-alone" documents in retrievable and auditable format.
- A selection of procurement engineering group packages was reviewed for contract requirements. Specifically, packages for EGS conduit seals and Target Rock solenoid valve replacements were reviewed. In all cases reviewed, procedural requirements were met to maintain equipment qualification.
- Equipment qualification information releases (EQIRs) issued since 2005 were reviewed. These EQIRs were technically adequate and contained the required documentation to provide equipment traceability in accordance with site procedures.
- Various plant work orders completed since 2005 were reviewed for compliance with EQ requirements. All were found adequate and acceptable in maintaining component qualification during maintenance and device replacement activities.

In 2010, it was observed that program procedures specify that an EQIR shall be filled out by the maintenance organization and sent to engineering each time changes are made when work is performed on any piece of 10 CFR 50.49-designated equipment. This is done to ensure the equipment traceability is maintained and that engineering documents reflect the "as constructed" status of the plant. The procedure requires this information to be sent to engineering within 15 days of the equipment being returned to service. Work was performed on a pressurizer gas space sample containment isolation valve in March 2010, and the equipment was returned to service. However, as of June 2010, no information had been forwarded to engineering to document equipment changes. The required documentation has now been submitted to engineering.

A program assessment in 2011 included the following elements.

- Listings of all design changes initiated during the review period were reviewed for EQ program impact. Of the 325 DCNs, there were only 18 DCNs that merited reviews. All the DCNs reviewed adequately met procedural requirements.
- EQ binders reviewed were technically adequate, conformed to 10 CFR 50.49 and procedural requirements, and are considered "stand-alone" documents, retrievable and auditable.
- Three procurement engineering group packages were randomly selected for review. In all cases reviewed, host safety classifications were correct and appropriate. Documentation requirements were to the correct vendor test reports and proper certificate of compliance requested to maintain the equipment qualification.
- A total of 135 EQIRs were reviewed. All were issued within the fifteen-day time limit. All EQIRs were technically adequate and contained the required documentation to provide equipment traceability in accordance with site procedures.
- The scheduled performance dates for various EQ tasks were reviewed for compliance with requirements. Various plant work orders completed since 2009 were reviewed for compliance with environmental qualification requirements and acceptability in maintaining component qualification during maintenance and device replacement activities. Eleven work orders were reviewed and issues were identified concerning failure to follow the procedure requirements. All the issues were resolved through the CAP. All of the tasks reviewed were adequate and met procedural requirements and were acceptable in maintaining component qualification during maintenance and device replacement activities.

The history of 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 Environmental Qualification (EQ) of Electric Components 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 Environmental Qualification (EQ) of Electric Components Program has been effective at managing the effects of aging by maintaining equipment within its qualification basis. The Environmental Qualification (EQ) of Electric Components Program provides reasonable assurance that the effects of aging are 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 and polymeric materials through periodic visual inspection of external surfaces during system inspections and walkdowns for evidence of leakage, loss of material (including loss of material due to wear), cracking, and change in material properties. When appropriate for the component and material, physical manipulation, such as touching, pressing, flexing, and bending, is used to augment visual inspections to confirm the absence of elastomer hardening and loss of strength. The 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 a frequency not to exceed a refueling cycle by personnel qualified through plant-specific programs. Deficiencies are documented and evaluated under the CAP. 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 components' intended functions are maintained. Surfaces that are insulated are inspected when exposed at such intervals to ensure the component's intended functions are maintained.

Examples of inspection parameters for metallic components include the following:

- Corrosion and material wastage (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.

Examples of 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.

For polymeric materials, the visual inspection will include 100 percent of the accessible components. The sample size of polymeric components that receive physical manipulation is at least ten 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(s). For stainless steel a clean shiny surface is expected. For flexible polymers 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 polymers no surface changes affecting performance such as erosion, cracking, crazing, checking, and chalking are expected. The acceptance standards include design standards, procedural requirements, current licensing basis, industry codes or standards, and engineering evaluations.

NUREG-1801 Consistency

The External Surfaces Monitoring Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M36, External Surfaces Monitoring of Mechanical Components.

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 External Surfaces Monitoring Program procedures to clarify that periodic inspections of systems in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(1) and (a)(3) will be performed. Inspections shall include areas surrounding the subject systems to identify hazards to those systems. Inspections of nearby systems that could impact the subject systems will include SSCs that are in scope and subject to aging management review for license renewal in accordance with 10 CFR 54.4(a)(2).

Element Affected	Enhancement
3. Parameters Monitored or Inspected	Revise External Surfaces Monitoring Program procedures to include instructions to look for the following related to metallic components: • Corrosion and material wastage (loss of material). • Leakage from or onto external surfaces (loss of material). • Worn, flaking, or 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.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Revise External Surfaces Monitoring Program procedures to include instructions for monitoring aging effects for flexible polymeric components, including manual or physical manipulations of the material, with a sample size for manipulation of at least ten percent of the available surface area. The inspection parameters for polymers shall include the following: • Surface cracking, crazing, scuffing, dimensional changes (e.g., ballooning and necking). • Discoloration. • Exposure of internal reinforcement for reinforced elastomers (loss of material). • Hardening as evidenced by loss of suppleness during manipulation where the component and material can be manipulated.
4. Detection of Aging Effects	Revise External Surfaces Monitoring Program procedures to ensure surfaces that are insulated will be inspected when the external surface is exposed (i.e., during maintenance) at such intervals that would ensure that the components' intended function is maintained.

Element Affected	Enhancement
6. Acceptance Criteria	Revise External Surfaces Monitoring Program procedures to include acceptance criteria. Examples include the following: • Stainless steel should have a clean shiny surface with no discoloration. • Other metals should not have any abnormal surface indications. • Flexible polymers 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 polymers should have no erosion, cracking, checking or chalks.

Operating Experience

In 2002, visual observation of the raw cooling water booster pumps casing and skids indicated extensive exterior corrosion. Work orders for repairs were initiated and completed.

While performing a program walk-down in 2003, white crusty deposits were noted on a vertical run of pipe beside column M-T6. A work order was processed to replace affected sections of piping.

A 2003 inspection found that the containment spray pumps on both units had corrosion on the coupling bolts for the pump bearing couplings. Work orders were completed to repair the coupling bolts prior to loss of function.

In 2003, visual inspection of the condenser circulating water traveling water screen frames on both units found the need for replacement due to age-related corrosion and degradation. Personnel initiated work orders to replace the degraded screens.

A 2003 visual inspection of glycol chiller "C" found corrosion on the carbon steel piping. A work order was processed to clean and coat piping prior to placing the chiller back in service.

During the performance of a 2003 inspection inside the letdown heat exchanger room, the following conditions were identified:

- Residue around the flange joint of the heat exchanger.
- Evidence on the floor of past flange leakage, although there was no active leak at the time of inspection.

- Several flange bolts and nuts were severely corroded, and a few were still wet from leakage.
- Stainless steel piping had a white ring of boron surrounding a damp patch of rust where leakage had occurred.

A work order was processed to correct these conditions.

In May 2004, an assessment of site inspections for plant systems/components susceptible to corrosion was performed. The site had not fully implemented the inspections, and actions were taken to specify the determination of susceptibility and performance of inspections. Walk-downs were completed for the major plant areas that were accessible.

Unit 2 incore instrument room chilled water isolation valves were inspected for corrosion in 2006. The inspection revealed several corroded valves and components. Metallurgical engineering evaluated the condition and stated the corrosion had not degraded the integrity of the valves. Work orders were processed to remove the corrosion and apply an approved coating to prevent future corrosion.

During an observation of work in the auxiliary building in 2009, extensive external corrosion on the inlet and discharge piping of both incore instrument room chiller pumps was observed. Copper corrosion was also present on the flex portion of the piping. Work orders were processed to clean and repair this piping.

Procedural guidance for a focused inspection to identify external corrosion on piping and plant components located in infrequently accessed areas was developed in June 2010. The first inspections were performed in October 2011. Corrective actions are initiated based on the results of these inspections to correct degraded corrections prior to loss of intended function.

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) and has proven effective in maintaining the material condition of plant systems.

The history of 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 External Surfaces Monitoring 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 External Surfaces Monitoring Program has been effective at identifying and managing aging effects of loss of material (including loss of material due to wear), cracking, and change in material properties on external surfaces that may result in leakage. The External Surfaces Monitoring Program provides reasonable assurance that the effects of aging are 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 TLAA by (a) tracking the number of critical thermal and pressure transients for selected components, (b) verifying that the severity of monitored transients are bounded by the design transient definitions for which they are classified, (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, and (d) addressing applicable fatigue exemptions. Tracking the number of critical thermal and pressure transients for the selected components ensures a code design usage factor of less than or equal to 1, including environment effects where applicable. The environmental effects on fatigue for the identified 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.

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

The following enhancements will be implemented at least two years prior to entering the period of extended operation.

Element Affected	Enhancement
1. Scope of Program 2. Preventive Actions 3. Parameters Monitored or Inspected	Revise Fatigue Monitoring Program procedures to monitor and track critical thermal and pressure transients for components that have been identified to have a fatigue TLAA.
1. Scope of Program 2. Preventive Actions 6. Acceptance Criteria	Fatigue usage calculations that consider the effects of the reactor water environment will be developed for a set of sample RCS components. This sample set will 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 will be determined as described in Section 4.3.3.
1. Scope of Program	Fatigue usage factors for the RCS limiting components will be determined to address the Cold Overpressure Mitigation System (COMS) event (i.e., low temperature overpressurization event) and the effects of the structural weld overlays.
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

Tracking of the number of critical thermal and pressure transients for selected components has been accomplished on a regular basis for both Unit 1 and Unit 2. The cumulative number of cycles and events has remained within calculation assumptions.

In 2007, it was noted that the number of SQN spray actuations (i.e., pressurizer spray operation with a differential temperature between the spray water and the pressurizer vapor temperatures greater than 320°F) was at risk of exceeding the technical specification and UFSAR limits. In response to this operating experience, justification was provided for applying partial cycle-counting to pressurizer spray actuations based upon the magnitude of the pressurizer spray water and pressurizer vapor temperature differential.

An engineering programs audit team performed a review of technical content and execution of the program in 2010. The team reviewed the two SQN SIs and data packages from 2008 through 2010 and identified four deficiencies. The first deficiency was errors in recording data for plant trips between two consecutive months in 2010 and errors in auxiliary feedwater addition times for three consecutive months at the end of 2008 and the beginning of 2009. The second deficiency identified an error in the RCS heat-up limit description in an appendix of an SI procedure. The third deficiency identified errors in data entry by Operations personnel on appendices for an SI procedure over several performances in 2008 and 2009. The fourth deficiency identified that two of the three calculations used as basis for the Component Cyclic I Transient Limit program were not able to be retrieved as QA records. The corrective actions initiated to resolve these deficiencies are as follows:

- The System Engineer was coached on the importance of maintaining a high attention to detail when entering data. The applicable plant documentation was revised to address the first deficiency.
- A procedure revision was processed to correct the administrative errors noted in the second deficiency.
- A communication was distributed to Operations personnel to reinforce that the data errors resulted from a failure to adhere to written instructions as noted in the third deficiency.
- The vendor calculations were documented in the TVA system as QA records to address the fourth deficiency.

The history of identifying program deficiencies and subsequent corrective actions provides reasonable assurance that the Fatigue Monitoring Program will remain effective. The application of these proven methods provides reasonable assurance that cracking due to fatigue will be managed such that affected 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 has been effective in identifying and managing the effects of aging due to fatigue. The Fatigue Monitoring Program provides reasonable assurance that the effects of aging due to fatigue are managed such that applicable components will continue to perform their intended function 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, 3M fire wrapping, spray-on fire proofing material, etc.). The program also performs periodic visual and functional testing of fire doors to ensure their operability and periodic visual inspections and testing of the CO_2 fire suppression system.

The program includes visual inspections of not less than ten percent of each type of penetration 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 due to loss of 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 freeze-thaw, 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 visual inspection of the fire door surfaces and functional testing of fire doors closing mechanisms and latches is at least once per refueling cycle.

The Fire Protection Program performs visual inspections of the CO_2 system every 18 months to identify conditions of corrosion that may lead to the loss of material. A functional test of the CO_2 system is performed every 18 months, in accordance with the Fire Protection Report. SQN does not have a halon 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
3. Parameters Monitored or Inspected	Revise Fire Protection Program procedures to include an inspection of fire barrier walls, ceilings, and floors for any signs of degradation such as cracking, spalling, or loss of material caused by freeze thaw, chemical attack, or reaction with aggregates.
6. Acceptance Criteria	Revise Fire Protection Program procedures to provide acceptance criteria of no significant indications of concrete cracking, spalling, and loss of material of fire barrier walls, ceilings, and floors and in other fire barrier materials.

Operating Experience

In 2005, a crack was discovered in the concrete block wall between the Unit 2 480 V shutdown board room 2B1 and the 6.9 kV shutdown board room corridor on the 2B1 side of the wall. A similar crack was found in the 2A1 480 V shutdown board room that had been repaired, and an additional crack was discovered in the wall at the end of the corridor between the 2A1 and 2B1 rooms. Three cracks were identified in almost the same locations on Unit 1. A functional evaluation was performed, and the cracks were determined to have a negligible effect on the structural characteristics of the wall and do not affect the ability of the wall to perform its structural design function and to meet Appendix R requirements. However, since the walls are rated fire barriers, work orders were completed to repair the cracked walls.

During a 2005 visual inspection of fire barriers, it was noted that a building interface was configured with a 1/4" plate welded on a 6" sleeve but had no other sealant material associated with it. Investigation indicated that this penetration was not identified in the penetration seal system description. An engineering evaluation concluded that this condition, while being outside the design basis requirements for the fire barrier, does not represent a condition adverse to the capability to achieve and maintain safe shutdown due to the other fire protection features present. A work order was processed to seal the penetration in accordance with specifications.

During a 2007 audit of the program, fire barriers were reviewed against design and regulatory bases. Selected records of design, installation, surveillance, maintenance, and testing were reviewed. These reviews were to confirm fire barriers have been designed, installed, monitored, and maintained appropriately. Based on the audit team's review, fire barriers were appropriate for objects protected and were in compliance with design and regulatory basis. The audit team identified a deficiency and corresponding recommendation for program enhancement involving fire barriers. The deficiency was that some fire barriers credited to support 10 CFR 50 Appendix R-approved deviations (termed special fire barriers) were not specifically inspected in fire barrier inspection surveillances. A revision to the fire barrier inspection SI to inspect special fire barriers, such as a partition wall between component cooling water pumps and a Pyrocrete box associated with the ERCW junction box, was approved in April 2007.

In 2008, a program audit determined that electrical raceway fire barrier systems, fire door(s), ventilation fire dampers, structural steel fireproofing, and electrical and piping penetrations were installed and in good material condition meeting standards and expectations.

During the 2008 triennial NRC fire protection inspection, the team inspected accessible passive fire barriers surrounding and within the fire areas selected for review. Barriers included walls, ceilings, floors, mechanical and electrical penetration seals, doors, and dampers. The team compared the fire barrier ratings in various design documents and drawings to the data contained in the fire protection report. Construction details and fire endurance test data which established the ratings of fire barriers were reviewed by the team. Engineering evaluations and relevant deviations described in licensee submittals and NRC safety evaluations related to fire barriers were reviewed. Electrical fire barrier raceway systems were observed in the plant to confirm that the appropriate materials and construction methods were used to assure that the respective fire barriers met their intended design function. No findings of significance were identified.

A Nuclear Electric Insurance Limited (NEIL) evaluation in 2009 included inspection of various hose stations, hydrant hose houses, fire hydrants, and fixed extinguishing systems. The fire protection impairment list was reviewed during this evaluation. The out-of-service time of impaired items was found to be kept to a minimum as required by the site procedure. The number of impaired items for which the operations fire protection group is responsible was found to be small, and the duration of impairments was minimized. During a NEIL evaluation in February 2007, there were six fire hydrants on the impairment list, which did not meet the NEIL loss control standards because of the length of time that the impaired hydrants were out of service. During the 2009 NEIL evaluation, the impairment list was reviewed and no long-term impairments were found. Repairs to the hydrants had been completed in March of 2008.

A 2010 assessment of fire barriers to verify that materials of appropriate fire rating were used to fill openings and penetrations found no discrepancies.

During the 2011 triennial NRC fire protection inspection (TFPI), the inspectors evaluated the adequacy of fire barrier walls, ceilings, floors, mechanical and electrical penetration seals, fire doors, fire dampers and electrical raceway fire barrier systems (ERFBS). The inspectors walked down accessible portions of selected fire areas to observe the material condition of fire barriers. The inspectors assessed the configuration of the installed ERFBS against the TVA installation and modification specification for ERFBS to confirm that the appropriate materials and construction methods were used to ensure the respective fire barriers met their intended design function. The inspectors reviewed fire hazards analysis calculations for the selected fire areas to verify that the plant fire loading was appropriate for the stated fire resistance rating of the fire barrier enclosures. The inspectors reviewed fire protection penetration seal details analysis against penetrations within the selected fire areas. The inspectors also reviewed a representative sample of completed surveillances for fire doors, fire dampers, penetration seals, and ERFBS performed since the last TFPI in June 2008. No findings were identified.

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 history of 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 Protection 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 Fire Protection Program has been effective at identifying and managing aging effects of cracking, loss of material, delamination, separation, and change in material properties on the external surfaces of fire protection components and structures. The Fire Protection Program provides reasonable assurance that the effects of aging are 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 and fouling for fire protection components that are tested in accordance with the Fire Protection Report.

Consistent with NFPA 25, the SQN program includes system performance testing in accordance with the Fire Protection Report. This periodic full-flow testing includes monitoring the pressure of tested pipe segments, which verifies that system pressure remains adequate for system intended functions. Results are trended. Periodic flushing is also performed in accordance with the Fire Protection Report.

Wall thickness measurements are evaluated to ensure minimum wall thickness is maintained. Wall thickness may be determined by non-intrusive measurement, such as volumetric testing, or as an alternative to non-intrusive testing, by visually monitoring internal surface conditions upon each entry into the system for routine or corrective maintenance. The use of internal visual inspections is acceptable when inspections can be performed (based on past maintenance history) on a representative number of locations. These inspections will be performed before the period of extended operation and at plant-specific intervals based on the initial test results during the period of extended operation. Periodic visual inspections of fire water system internals will monitor surface condition for indications of loss of material.

In addition, the water system pressure is continuously monitored such that loss of pressure is immediately detected and corrective action initiated. If not replaced, sprinkler heads are tested before the end of 50-year sprinkler service life and every ten years thereafter during the period of extended operation. General requirements of the program include testing and maintaining fire detectors and visually inspecting the fire hydrants to detect signs of corrosion. Fire hydrant flow tests are performed annually to ensure the fire hydrants can perform their intended function.

Program acceptance criteria are (a) the water based fire protection system can maintain required pressure, (b) no signs of unacceptable degradation are observed during non-intrusive or visual inspections, (c) minimum design pipe wall thickness is maintained, and (d) no biofouling exists in the sprinkler systems that could cause corrosion in the sprinklers.

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.

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 Fire Water System Program procedures to include periodic visual inspection of fire water system internals for evidence of corrosion and loss of wall thickness.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to include one of the following options: • Wall thickness evaluations of fire protection piping using non-intrusive techniques (e.g., volumetric testing) to identify evidence of loss of material will be performed prior to the period of extended operation and periodically thereafter. Results of the initial evaluations will be used to determine the appropriate inspection interval to ensure aging effects are identified prior to loss of intended function. • A visual inspection of the internal surface of fire protection piping will be performed upon each entry into the system for routine or corrective maintenance. These inspections will be capable of evaluating (1) wall thickness to ensure against catastrophic failure and (2) the inner diameter of the piping as it applies to the design flow of the fire protection system. Maintenance history shall be used to demonstrate that such inspections have been performed on a representative number of locations prior to the period of extended operation. A representative number is 20 percent of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. (continued below)

Element Affected	Enhancement
4. Detection of Aging Effects (continued)	Additional inspections will be performed as needed to obtain this representative sample prior to the period of extended operation and periodically during the period of extended operation based on the findings from the inspections performed prior to the period of extended operation.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to ensure a representative sample of sprinkler heads will be tested or replaced before the end of the 50-year sprinkler head service life and at ten-year intervals thereafter during the extended period of operation. NFPA 25 defines a representative sample of sprinklers to consist of a minimum of not less than four sprinklers or one percent of the number of sprinklers per individual sprinkler sample, whichever is greater. If the option to replace the sprinklers is chosen, all sprinkler heads that have been in service for 50 years will be replaced.
4. Detection of Aging Effects	Revise Fire Water System Program procedures to consider implementing the flow testing requirements of NFPA 25 or justify why the flow testing requirements of NFPA should not be implemented.
6. Acceptance Criteria	Revise Fire Water System Program procedures to include acceptance criteria for periodic visual inspection of fire water system internals for corrosion, minimum wall thickness, and the absence of biofouling in the sprinkler system that could cause corrosion in the sprinklers.

Operating Experience

As a result of NRC IN 2002-24, "Potential Problems with Heat Collectors on the Fire Protection Sprinklers," SQN is replacing the sprinkler heads that have heat collectors above them with appropriate type intermediate heads. The sprinkler systems are being taken out of service as plant conditions allow, and the sprinkler heads are then replaced. This work is scheduled to complete in November 2013.

In 2008, a program audit identified missing inspections on a sprinkler system. It was noted that the Unit 2 HEPA filter plenum room sprinkler system was not inspected during July 2007. The

HEPA filter plenum sprinkler system was then inspected in the January 2009 performance of the procedure. Instructions were issued in February 2009 to clarify expectation to use a PER instead of a work order to document any incomplete SI or periodic instruction performance.

TVA plans to resolve problems with sprinkler heads identified during the 2008 and 2011 triennial NRC fire protection inspections by relocating sprinkler heads to comply with NFPA 13. The issues in the control building have been resolved. Work is still in progress to resolve the NRC-identified issues in the auxiliary building.

A 2010 assessment of fire suppression systems identified deficiencies in transformer deluge valves and the associated isolation valves. Problems with the diesel-driven fire pump were also identified. The deluge valves and associated isolation valves for transformers were replaced for systems in the switchyard. The diesel-driven fire pump was refurbished.

A leaking sprinkler head on turbine building wet pipe sprinkler system #3 was identified and replaced in 2010. The head was leaking from between the nozzle and the cap. There was no loss of intended function of the sprinkler head.

The history of 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 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 Fire Water System Program has been effective at identifying and managing aging effects of loss of material and fouling of the internal surfaces of fire protection components that contain water used for fire suppression. The Fire Water System Program provides reasonable assurance that the effects of aging are 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 for carbon steel piping and components by (a) performing an analysis to determine systems subject to FAC and internal and external erosion, (b) conducting appropriate analysis to predict wall thinning, (c) performing wall thickness measurements based on wall thinning predictions, and (d) evaluating measurement results to determine remaining service life and the need for replacement or repair of components. A representative sample of components is selected based on the most susceptible locations for wall thickness measurements at a frequency in accordance with NSAC-202L guidelines to ensure that degradation is identified and mitigated before the component integrity is challenged. Measurement results are used to confirm predictions and to plan long-term corrective action. In the event measurements of wall thinning exceed predictions, the extent of the wall thinning is determined as a part of the CAP. The program relies on implementation of guidelines published by EPRI in NSAC-202L, Rev. 3, and 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 determining wall thickness. When field measurements show that the predictive code is not conservative, the model is recalibrated. The model is also adjusted as a result of any power up-rates. Components predicted to reach the minimum allowed wall thickness before the next scheduled outage are isolated, repaired, replaced, or reevaluated under the CAP.

NUREG-1801 Consistency

The FAC Program, with enhancement, will be consistent with the program described in NUREG-1801, Section XI.M17, Flow-Accelerated Corrosion.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Element Affected	Enhancement
1. Scope of Program 4. Detection of Aging Effects	Revise FAC Program procedures to implement NSAC-202L guidance for examination of components upstream of piping surfaces where significant wear is detected.

Operating Experience

During the Unit 2 refueling outage in 2006, there were no unplanned repairs or replacements because of FAC degradation.

In 2009, Unit 1 outage inspection scope was 102 components. Three nozzles off the # 3 heater drain tank and the downstream valves were visually inspected for FAC. There were no unplanned repairs or replacements because of FAC degradation discovered during this outage.

In 2009, the implementing procedure was enhanced to add a new gridding requirement for small-bore piping based on operating experience with the program. Rather than providing a scan of the entire piping but then recording only the low point, the procedure now provides for better repeatability of data acquisition by gridding small bore piping.

A 2009 revision of the system susceptibility evaluation incorporated recent operating experience from McGuire and Arkansas Nuclear One. Failures at these stations, caused by FAC on small-bore piping, resulted in unit trips and created the possibility of personnel injury. In response, SQN increased the frequency of inspection of such piping and increased the significance level of these lines in the susceptible non-modeled basis document.

During the Unit 2 outage in 2009, the FAC program had no emergent issues for repair or replacement because of FAC degradation discovered during the outage.

An engineering assessment in 2010 reviewed evaluation criteria to assess FAC, attributes observed in effective programs, and recent areas for improvements. The assessment found no significant gaps related to implementation of the FAC program at SQN. The program owner has actively participated in the EPRI users group and has attended both EPRI CHECWORKS and EPRI FAC training. Component gridding practice at SQN is in accordance with EPRI NSAC guidance. There have been no FAC-related leaks at SQN for at least two operating cycles for each unit.

In 2010, Unit 1 inspection scope was 135 pre-outage inspections. Replacement of condensate lines in a thermal expansion loop was completed using FAC-resistant materials. Replacement of these condensate lines was driven by a review of operating experience. There were no unplanned repairs or replacements due to inspections during this outage.

In 2011, operating experience related to the Catawba extraction steam near-miss was addressed. Inspections related to this experience were added to the SQN FAC program.

SQN has had no steam leaks due to FAC in the previous ten years. SQN has extensively upgraded piping in the susceptible non-modeled small bore category. A generic design change notice to upgrade secondary side pipe materials from carbon steel to FAC-resistant material is used.

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 81-28, IN 92-35, IN 95-11, IN 2006-08, IN 97-84, IN 89-53, IN 91-18, IN 93-21, IN 97-84, and Licensee Event Report 50-237/2007-003-00.

The history of 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 Flow-Accelerated Corrosion 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 Flow-Accelerated Corrosion Program has been effective at identifying and managing aging effect of loss of material due to flow-accelerated corrosion and erosion. The Flow-Accelerated Corrosion Program provides reasonable assurance that the effects of aging are 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 FLUX THIMBLE TUBE INSPECTION

Program Description

The Flux Thimble Tube Inspection Program manages loss of material due to wear of the flux thimble tube walls in the path from the reactor vessel instrument nozzles to the fuel assembly instrument guide tubes. Nondestructive examination (NDE) methodology such as eddy current testing or other NRC-accepted inspection methods are used to measure wall thickness and will be used during the period of extended operation. This program implements the recommendations of NRC Bulletin 88-09, "Thimble Tube Thinning in Westinghouse Reactors," in regards to NDE such as eddy current testing or other justified and NRC-approved method used to monitor flux thimble tube wear.

The scope of the program includes the flux thimble tubes that form part of the reactor coolant system pressure boundary. Wall thickness measurements are compared to previously calculated wear rates to ensure there is sufficient wall thickness in the flux thimble tubes to meet their intended function. The acceptance criteria include allowances for factors such as instrument uncertainties and uncertainties in wear scar geometry. The acceptance criteria are consistent with those previously documented in the response to NRC Bulletin 88-09 and its amendments. Examination frequency is based upon actual plant-specific wear data and wear predictions that have been technically justified based on conservative estimates of flux thimble wear. The interval between inspections is established such that no flux thimble tube is predicted to incur wear that exceeds the established acceptance criteria before the next inspection. When new wear-resistant flux thimble tube materials are incorporated into the design (e.g., chrome-plated stainless steel), sufficient inspections are conducted at an adequate inspection frequency for the new material. Flux thimble tubes that do not meet the acceptance criteria are isolated, capped, plugged, withdrawn, replaced, or otherwise removed from service to ensure the integrity of the reactor coolant pressure boundary. Where appropriate, analyses are used to allow repositioning of flux thimble tubes that are approaching the acceptance criteria limit. Flux thimble tubes that cannot be inspected over the tube length of interest or that are subject to wear due to restrictions or other defects and cannot be shown to be satisfactory for continued service are removed from service.

NUREG-1801 Consistency

The Flux Thimble Tube Inspection Program, with enhancement, will be consistent with the program described in NUREG-1801, Section XI.M37, Flux Thimble Tube Inspection.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects 7. Corrective Action	Revise Flux Thimble Tube Inspection Program procedures to include a requirement to address if the predictive trending projects that a tube will exceed 80 percent wall wear prior to the next planned inspection, then initiate a service request to define actions (i.e., plugging, repositioning, replacement, evaluations, etc.) required to ensure that the projected wall wear does not exceed 80 percent. If any tube is found to be > 80 percent through-wall wear, then initiate a service request to evaluate the predictive methodology used and modify as required to define corrective actions (i.e., plugging, repositioning, replacement, etc.)

Operating Experience

Due to the potential thinning of thimble tubes as reported in NRC Bulletin 88-09 and IN 87-44 Supplement 1, TVA commenced augmented examinations of the thimble tubes at SQN Unit 1 and Unit 2 using eddy current examination in 1990. All thimble tubes are typically examined each refueling outage.

Program operating experience was used in 2003 to revise the procedure for maintenance and inspection of the bottom-mounted instrument incore flux detector thimble tubes, adding steps to update the acceptance criteria for remake of fittings and to add enhanced guidance for tightening fittings and for the use of an inspection gauge. A caution was added concerning expansion of thimble tubes. In 2006, this procedure was again revised to add a step for documenting borated water leaks. In 2010, guidance was provided to allow the use of chrome-plated thimble tubes, which require no expanding for make-up with the Swagelok fittings.

An electrically driven probe pusher has been developed to facilitate thimble tube testing. During the refueling outages in 2010 and 2011, chrome-plated thimble tubes were used for the first time as thimble tube replacements. No detectable wear was identified of the chrome-plated tubes that were checked during the most recent Unit 1 outage.

As discussed in element 10 to NUREG-1801, Section XI.M37, this program considers the technical information and industry operating experience provided in NRC IE Bulletin 88-09.

The history of 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 Flux Thimble Tube 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 Flux Thimble Tube Inspection Program has been effective at identifying and managing aging effect of loss of material due to wear of the flux thimble tube walls. The Flux Thimble Tube Inspection Program provides reasonable assurance that the effects of aging are 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

Program Description

The Inservice Inspection (ISI) Program manages loss of material, cracking, thermal embrittlement, flaw growth, 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 volumetric, surface, and/or visual examination and leakage testing of ASME Class 1, 2 and 3 component 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 ten 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

An assessment of the Inservice Inspection Program against industry standards was completed in August 2002. All necessary inspections were found to be scheduled as required.

An assessment of the NDE aspects of the program was completed in June 2005. The latest industry standards for qualification of VT-2 visual examination personnel were being used. Ultrasonic (UT) examinations on the safety injection system were reviewed and found to use properly qualified personnel and procedures meeting the highest standards observed in the industry. Determination of code coverage was properly documented. Results of ISI inspections were reviewed by experienced ISI NDE personnel on the TVA staff to assure quality and compliance with applicable requirements.

An assessment of the ISI summary report from the Unit 1 spring 2006 refueling outage was performed in June 2006. The assessment determined that information required by 10 CFR 50.55a was provided in the ISI summary report; however, several editorial changes were recommended which were incorporated by the ISI program specialist.

An assessment of the ISI summary report from the Unit 2 fall 2006 refueling outage was performed in February 2007. The assessment found the report complete and in compliance with applicable program and regulatory requirements.

NRC integrated inspections of the program were completed in June 2009, December 2009, December 2010, and June 2011. No findings of significance were identified.

SQN ISI summary reports between 2006 and 2011 demonstrate that the program is effective for managing aging effects in accordance with the ASME Boiler Pressure Vessel Code Section XI. Specifically, the reports identified indications and flaws that were evaluated and repaired if necessary prior to a loss of intended function.

Examinations performed during the Unit 1 spring 2009 refueling outage identified one unacceptable indication which required evaluation for continued operation. This indication had been identified by the site's augmented ISI program, and thus the location was outside the normal scope of the program. This was identified, reported, and addressed in accordance with the thermal fatigue guidance in MRP-146.

Examinations performed during the Unit 2 fall 2009 refueling outage identified unacceptable indications which required evaluation for continued operation. Two subsurface flaws were recorded and evaluated in a nozzle-to-vessel weld in the main steam system. The two flaws had been previously identified and were found to remain unchanged in size since initial discovery. Since the two flaws exceed the allowable flaw size limits for this area, engineering performed an analytical evaluation. The flaws were found acceptable for continued operation.

Examinations performed during the Unit 1 fall 2010 refueling outage identified no unacceptable indications that required evaluation or repair.

Examinations performed during the Unit 2 spring 2011 refueling outage identified no unacceptable indications that required evaluation or repair.

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 97-19, IN 98-11, IN 97-46, NRC Bulletin 88-08, IN 2001-05, IN 2003-11, IN 2004-11, IN 2006-27, and IN 2005-02.

The history of 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 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 Inservice Inspection Program has been effective at identifying and managing aging effects of loss of material, cracking, thermal embrittlement, flaw growth, and reduction in fracture toughness for ASME Class 1, 2 and 3 pressure retaining components. The Inservice Inspection Program provides reasonable assurance that the effects of aging are 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 INSERVICE INSPECTION – IWF

Program Description

The Inservice Inspection – IWF (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 program is credited for managing the effects of aging of ASME Class 1, 2, and 3 piping and component supports for license renewal. SQN utilizes a free-standing steel containment vessel design and does not have Class MC supports.

The program is currently on its third ten-year ISI inspection interval. The 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 SQN ISI program is updated each successive 120-month inspection interval to comply with the requirements of the latest edition of the ASME Code specified twelve months before the start of the inspection interval.

The ISI-IWF Program scope of inspection for component supports is based on sampling of piping supports and 100 percent of component supports other than piping as specified in Table IWF-2500-1. The sample size varies depending on the ASME Code classification of the piping.

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 a sample size that considers 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 of 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 are required to be examined.

Discovery of support deficiencies during regularly scheduled inspections are entered in the CAP. If the deficiencies exceed 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 or degradation of component supports such as verification of clearances, settings, physical displacements, loose or missing parts, debris, corrosion, wear, erosion, or the loss of integrity at welded or bolted connections.

The ISI-IWF Program is augmented by plant procedures 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. These procedures include the guidance of EPRI TR-104213, NUREG-1339, and EPRI NP-5769 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.

Identified degradations that could compromise the component support intended function are entered in the plant CAP for evaluation or correction 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 enhancement, 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 enhancement will be implemented prior to the period of extended operation.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise ISI-IWF Program procedures to clarify that detection of aging effects will include monitoring anchor bolts for loss of material, loose or missing nuts, and cracking of concrete around the anchor bolts.

Operating Experience

A review of owner's activity reports for inspections performed during the 2009-2011 refueling outages for Unit 1 and Unit 2 showed that all IWF support inspections were performed as scheduled. All discrepancies were evaluated and corrected as necessary, as described in the following summary information.

Unit 1 Spring Refueling Outage 2009 90-Day ISI Summary Report

Five unacceptable indications were identified that required evaluation for continued operation.

- Examination of CCH-0486 revealed a broken tack weld. Engineering evaluation found that the tack weld was not essential for support function.
- Examination of 1-SIH-461 support revealed misalignment. The engineering evaluation determined it acceptable as-is. An administrative change was processed to document the alignment condition on the support drawing.
- Examination of CCH-1044 support revealed a loose locknut. The engineering evaluation determined it acceptable as-is. The nut was tightened.
- Examination of SGH-2-1 support revealed a damaged retainer wire and support misalignment. The engineering evaluation determined the misalignment was acceptable as-is. The retainer wire was replaced.
- Examination of 1-SIH-359 support revealed an out-of-tolerance spring can. The spring can was adjusted to within tolerance.

Unit 1 Fall 2010 Refueling Outage 90-Day ISI Summary Report

Five unacceptable indications were identified that required evaluation for continued operation.

- Examination of pipe support 1-AFDH-061 identified that spring can settings were slightly less than the designed range. Engineering evaluation determined it acceptable as-is for the support setting.
- Examination of support 1-LHXISIH-1 identified a loose bolt in the wall plate attachment. Engineering evaluation determined it acceptable as-is.
- Examination of support CCHXH-1A1 identified loose bolting. Engineering evaluation determined it acceptable as-is.
- Examination of pipe support 1-CVCH-565 identified that spring can settings were slightly less than the designed range. Engineering evaluation determined it acceptable as-is for the support setting.
- Examination of pipe support 1-RCH-922 identified that the pipe clamp was slightly misaligned. Engineering evaluation determined it acceptable as-is.

Unit 2 Fall 2009 Refueling Outage 90-day ISI Summary Report

Three unacceptable indications were identified that required evaluation for continued operation.

- Examination of pipe support 2-AFDH-061 identified that spring can settings were slightly less than the designed range and one bolt was missing from the pipe clamp. Engineering evaluation determined that the support setting was acceptable as-is. The missing bolt was replaced.
- Examination of pipe support 2-MSH-425 identified that the spring can setting was out of range. The spring can was adjusted to within tolerance.
- Examination of pipe support 2-RCH-922 identified that the spring can settings were slightly less than the designed range. Engineering evaluation determined that the support setting was acceptable as-is.

Unit 2 Spring 2011 Refueling Outage 90-Day ISI Summary Report

Two unacceptable indications were identified that required evaluation for continued operation.

- Examination of 2-AFDH-223 pipe support identified a misaligned pipe clamp. Engineering evaluation concluded the condition was acceptable as-is, with no adjustment required.
- Examination of 1-CCH-404 support identified the spring can setting out of range. Engineering evaluation determined that the support setting was acceptable as-is.

A benchmark assessment of the ISI-IWF Program against the same program at Duke Energy was performed in 2011. The adequacy and effectiveness of the program at SQN was confirmed by this assessment.

The history of 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 ISI-IWF 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 ISI-IWF Program has been effective at identifying and managing the aging effects of loss of material of ASME Class 1, 2, and 3 component supports. The ISI-IWF Program provides reasonable assurance that the effects of aging are 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 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 aging management program. Inspection activities are implemented through plant procedures. The existing 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 crane rail wear of cranes and hoists in the scope of 10 CFR 54.4. The activities rely on visual examinations and functional testing to ensure that cranes and hoists are capable of sustaining their rated loads, thus ensuring their intended function is maintained during the period of extended operation. The functional test examinations are performed on active components of the crane to ensure proper functionality and are not credited for managing 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, lifting devices, and rails in the rail system and includes cranes and hoists that meet the provisions of 10 CFR 54.4(a)(1) and (a)(2) as well as NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants."

The aging management activities specified in this program will be enhanced to 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
1. Scope of Program 3. Parameters Monitored or Inspected	Revise program procedures to specify the inspection scope will include monitoring of rails in the rail system for wear; monitoring structural components of the bridge, trolley and hoists for the aging effect of deformation, cracking, and loss of material due to corrosion; and monitoring structural connections/bolting for loose or missing bolts, nuts, pins or rivets and any other conditions indicative of loss of bolting integrity.
3. Parameters Monitored or Inspected	Revise program procedures to include the inspection requirements of ASME B30.2.
4. Detection of Aging Effects	Revise program procedures to include the inspection frequency requirements of ASME B30.2.
6. Acceptance Criteria	Revise program procedures to clarify that the acceptance criteria will include requirements for evaluation in accordance with ASME B30.2 of significant loss of material for structural components and structural bolts and significant wear of rail in the rail system. Revise program procedures to clarify that the acceptance criteria and maintenance and repair activities use the guidance provided in ASME B30.2.

Operating Experience

During work performed between November and December 2002, an inspection of auxiliary building crane rail bolts found broken bolts rubbing the seismic restraints. The broken bolts were repaired. Three broken studs were replaced with a new stud design. New nuts and lockwashers were also installed during this repair. The cause of the bolting failure was identified as over-torquing of the bolts. The inspection also found indications of wear on the ends of some bolts, caused by rubbing of the seismic restraint. Those bolts showing wear were found to have excessive thread length above the hold-down nut. A work order was implemented to correct the issue of bolt-to-restraint contact.

A 2004 inspection found that an embedded concrete J-bolt holding a rail clip was sheared near the concrete surface. The J-bolt was replaced with an upgraded rail clip design using an improved undercut anchor technique.

A 2004 inspection of the auxiliary building crane bridge trucks identified cracks in the welds and base metal. The cracks were located on the outboard side of the trucks. The apparent root cause was inadequate welds on the bottom tension flange of the truck section. The welds in question were replaced with a structural tube steel member. Large vertical stiffeners were added to reinforce the outboard web section of the trucks.

The history of identification of degradation and initiation of corrective action prior to loss of intended function provides reasonable assurance that the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program will remain effective. The application of these proven visual 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 Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program has been effective at identifying and managing the aging effect of loss of material of crane rails and structural steel components of cranes. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program provides reasonable assurance that the effects of aging are 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 INTERNAL SURFACES IN MISCELLANEOUS PIPING AND DUCTING COMPONENTS

Program Description

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program is a new program that will manage fouling, cracking, loss of material, and change in material properties using opportunistic visual inspections of the internal surfaces of piping and components during periodic surveillances or maintenance activities when the surfaces are accessible for visual inspection. For metallic components, visual inspection of surface conditions will be used to detect loss of material, fouling and cracking. For elastomeric components, visual inspections and physical manipulation will be used to detect cracking and change in material properties. The program will monitor surface condition for visible evidence of loss of material in metallic components and changes in material properties for elastomeric components, including possible evidence of surface discontinuities. 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 ten percent of available surface area, including visually identified suspect areas.

Specific acceptance criteria will be as follows:

- Stainless steel: clean surfaces, shiny, no abnormal surface condition.
- Metals: no abnormal surface condition.
- Flexible polymers: a uniform surface texture and color with no cracks, no unanticipated dimensional change, and no abnormal surface conditions.
- Rigid polymers: no surface changes affecting performance such as erosion and cracking.

Conditions that do not meet the acceptance criteria will be entered into the CAP 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.

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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

A review of operating experience for plant systems with repetitive losses of component intended function due to aging effects was performed. Based on this review, it was determined that the Internal Surfaces in Miscellaneous Piping and Ducting Components Program would be inappropriate for managing aging effects for these material-environment combinations in the following plant systems:

- Combinations: copper alloy-condensation, and carbon steel-waste water.
- Systems: ventilation, station drain, waste disposal, and diesel generators.

Therefore, the plant-specific Periodic Surveillance and Preventive Maintenance Program (Section B.1.31) manages the effects of aging for these material and environment combinations in these systems.

A search of SQN operating experience for internal environments of air or gas identified no aging mechanisms not considered in NUREG-1801. The SQN 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 this program is effective for managing the aging effects described herein.

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. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 will be effective at identifying and managing aging effects due to fouling, cracking, loss of material, and change in material properties of internal surfaces, since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. 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.1.20 MASONRY WALL

Program Description

The Masonry Wall Program is implemented as part of the Structures Monitoring Program (Section B.1.40). The Masonry Wall Program is based on guidance provided in IE Bulletin 80-11, "Masonry Wall Design," and IN 87-67, "Lessons Learned from Regional Inspections of Licensee Actions in Response to IE Bulletin 80-11." The scope of the Masonry Wall 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 identified as performing intended functions in accordance with 10 CFR 54.4. Included components are 10 CFR 50.48-required masonry walls, radiation shielding masonry walls, and masonry walls with the potential to affect safety-related components. Structural steel components, steel edge supports, and steel bracing of masonry walls are managed by the Structures Monitoring Program (Section B.1.40).

Masonry walls are inspected at least every five years, with provisions for more frequent inspections, to ensure there is no loss of intended function between inspections.

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

Enhancements to this program are included in the enhancements to the Structures Monitoring Program (Section B.1.40).

Operating Experience

A baseline inspection of masonry walls was completed in 1997. This baseline inspection identified cracks in several reinforced block walls in the diesel generator building. These cracks were evaluated and determined to have an "insignificant effect on the ability of the reinforced walls to withstand all design loadings" and thus were identified collectively as a non-degraded condition. No other masonry wall defects were identified during the baseline inspection.

Several small-diameter holes were identified in concrete block walls during a 1999 inspection in the control building. The block walls are designated as fire barrier walls. The holes penetrate through one side of the block face into the hollow core space. Although the fire barrier walls were considered operable, a work order was completed to repair the holes.

Follow-up inspections of masonry walls were completed in 2002. Masonry walls were examined for cracks, missing or broken blocks, and other discrepancies. No additional masonry wall defects were identified during the follow-up inspections.

In 2005, a crack was discovered in the concrete block wall between the Unit 2 480 V shutdown board room 2B1 and the 6.9 kV shutdown board room corridor on the 2B1 side of the wall. A similar crack was found in the 2A1 480 V shutdown board room that had been repaired, and an additional crack was discovered in the wall at the end of the corridor between the 2A1 and 2B1 rooms. Three cracks were identified in almost the same locations on Unit 1. A functional evaluation determined that the cracks had a negligible effect on the structural characteristics of the wall and did not affect the ability of the wall to perform its structural design function and to meet Appendix R requirements. However, since the walls are a rated fire barrier, work orders were completed to repair the cracked walls.

Follow-up inspections of masonry walls were completed in 2006 and 2007. Masonry walls were examined for cracks, missing or broken blocks, and other discrepancies. All defects were identified and evaluated without need for repair.

As discussed in element 10 to NUREG-1801, Section XI.S5, this program considers the technical information and industry operating experience provided in NRC IE Bulletin 80-11, NRC GL 87-02, NRC IN 87-67, and NUREG-1522.

The history of identification of degradation and initiation of corrective action prior to loss of intended function provides reasonable assurance that the Masonry Wall 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 Masonry Wall Program has been effective at identifying and managing the aging effects of loss of material and cracking of concrete block wall components. The Masonry Wall Program provides reasonable assurance that the effects of aging are 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 METAL ENCLOSED BUS INSPECTION

Program Description

The Metal Enclosed Bus Inspection Program is a new condition monitoring 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 following MEB required for recovery of offsite power: MEB associated with CSST A, CSST B, CSST C, the 6.9 kV start buses (1A, 1B, 2A, 2B), and the 6.9 kV unit boards (1A, 1B, 1C, 1D, 2A, 2B, 2C, 2D).

Inspections of MEB will include the bus and bus connections, the bus enclosure assemblies, and the bus insulation and insulators. A sample of the accessible bolted connections will be inspected for loose connections. The bus enclosure assemblies will be inspected for loss of material and elastomer degradation. This program will be used instead of the Structures Monitoring Program for external surfaces of the bus enclosure assemblies. The bus insulation or insulators will be inspected for degradation leading to reduced insulation resistance. These inspections will include visual inspections, as well as quantitative measurements, such as thermography or connection resistance measurements, as required.

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 ten years. This inspection will be performed in this program instead of in the Structures Monitoring Program (Section B.1.40).

MEB enclosure assemblies will be visually inspected internally 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 water intrusion.

Bus insulation will be 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, discoloration, or swelling, which may indicate overheating or aging degradation. Internal bus supports 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 ten years for loose connections 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 ten 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.

The alternative to quantitative measurements could be used for accessible MEB bolted connections covered with heat shrink tape or insulating boots. 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 five 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 ten years.

The inspections will be completed before the period of extended operation and every ten 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 five 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 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 SQN 10 CFR 50 Appendix B quality assurance program.

There is no operating experience at SQN involving the aging effects managed by this program. 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 SQN in other programs. Accordingly, there is reasonable assurance that this new aging management program will be effective during the period of extended operation.

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 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 will be effective for managing the effects of aging since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. 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.1.22 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 racks that could compromise the criticality analysis will be detected. The program relies on periodic inspection, testing, and other monitoring activities to assure that the required five percent sub-criticality margin is maintained during the period of extended operation. The program is established to monitor loss of material and changes in dimension such as gaps, 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 frequency of testing will be based on the results of initial inspections prior to the period of extended operation and will not exceed every ten years. The approach to relating measurement results of the coupons considers the exposure the coupons have received versus the exposure the spent fuel racks have received. In the event that a loss of neutron-absorbing capacity is anticipated based on coupon testing, additional testing will be performed to ensure the sub-criticality requirements.

NUREG-1801 Consistency

The Neutron-Absorbing Material Monitoring Program, with enhancements, will be consistent to 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 enhancements will be implemented prior to the period of extended operation.

Element Affected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Revise Neutron-Absorbing Material Monitoring Program procedures to perform blackness testing of the Boral coupons within the ten years prior to the period of extended operation and at least every ten years thereafter based on initial testing to determine possible changes in boron-10 areal density.
4. Detection of Aging Effects	Revise Neutron-Absorbing Material Monitoring Program procedures to relate physical measurements of Boral coupons to the need to perform additional testing.

5. Monitoring and Trending	Revise Neutron-Absorbing Material Monitoring Program procedures to perform trending of coupon testing results to determine the rate of degradation and to take action as needed to maintain the intended function of the Boral.

Operating Experience

In 1995, twelve coupons were placed in the spent fuel pool. The coupons, supplied by HOLTEC International, are the same material as the installed high-density fuel storage racks in terms of thickness, chemistry, finish, and temper. As of November 2009, no indication of degradation (such as bulging of the cells causing fuel handling issues) had been observed, although coupon testing had not yet begun.

In response to industry operating experience documented in NRC IN 2009-26, "Degradation of Neutron-Absorbing Materials in the Spent Fuel Pool," SQN developed guidance in 2011 for monitoring these coupons. Operating experience from R.E. Ginna nuclear power plant and from the neutron absorber users group (EPRI) was applied to the development of this guidance. This guidance directs the station to periodically remove and inspect coupons. The inspection monitors the coupons in the spent fuel pool to detect or anticipate potential or actual corrosion of the high density fuel storage racks. Monitoring includes measurement of size and weight and observations of the potential formation and behavior of any blisters

As discussed in element 10 to NUREG-1801, Section XI.M40, this program considers the industry operating experience with aging effects for this functional area at Vogtle, Seabrook, Beaver Valley, and Palisades.

The history of 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 Neutron-Absorbing Material Monitoring 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 Neutron-Absorbing Material Monitoring Program is effective at identifying and managing aging effects related to the degradation of neutron-absorbing material. The Neutron-Absorbing Material Monitoring Program provides reasonable assurance that the effects of aging are 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 NICKEL ALLOY INSPECTION

Program Description

The Nickel Alloy Inspection Program manages cracking due to primary water stress corrosion cracking (PWSCC) for nickel-alloy 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 PWR vessel, pressurizer components, and piping that contain PWSCC-susceptible dissimilar metals (Alloys 600/82/182) and (b) inspection requirements for reactor coolant pressure boundary components.

The program monitors for reactor coolant pressure boundary cracking and leakage using various methods, including NDE techniques, radiation monitoring, and visual inspections for boric acid deposits, leakage, 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 and industry guidelines (e.g., EPRI 1010087 [MRP-139]). 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 is 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 and industry guidelines (e.g., MRP-139).

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

In response to industry operating experience documented in WCAP-15988-NP, MRP 2003-039, and NRC Bulletin 2004-01, TVA began performing augmented ultrasonic examinations of Alloy 600 and Alloy 82/182 nozzle-to-safe end weld locations starting in the first period of the third ISI interval (2006). To date, many of the SQN alloy 600 locations have been mitigated. The remaining inspections are required by ASME Code Cases and are implemented in accordance with ASME Section XI requirements.

The reactor pressure vessel closure head penetrations are examined in accordance with ASME code case N-729-1, subject to 10 CFR 50.55a conditions. These examinations are scheduled and documented in accordance with the ASME Section XI Inspection program.

Full structural weld overlays were applied during the fall 2006 Unit 2 outage and the fall 2007 Unit 1 outage on the pressurizer nozzle safe ends. Sequoyah performed UT examinations, to the maximum extent possible, on the six safe end-to-pipe welds prior to installation of the structural weld overlays. Results were acceptable. However, examinations of the Alloy 82/182 nozzle-to-safe end welds were not performed due to the nozzle configuration. Since the required coverage could not be obtained prior to installation of the overlay, the welds cannot be classified as "uncracked" per ASME Code Case N-770-1, and the new overlay welds must be inspected per ASME Code Case N-770-1 Item Number "F". These mitigated welds have been added to the ISI Program (Section B.1.16) as new welds in accordance with ASME Section XI, IWB-2412(b). Augmented inspections of the pressurizer nozzle overlay welds were completed during the fall 2009 Unit 2 outage and the fall 2010 Unit 1 outage. Results were acceptable.

On Unit 2, bottom head visual inspections were performed during the refueling outages in fall 2006 and fall 2009. Results were acceptable.

In the fall 2007 Unit 1 refueling outage, an enhanced bare-metal visual examination of the reactor vessel closure head and head penetrations was performed using a remote robotic camera. Results were acceptable.

On Unit 1, bottom head visual inspections were performed during the refueling outages in fall 2007, spring 2009, and spring 2012. Results were acceptable.

An assessment to determine if the program met established industry standards and regulatory requirements was completed in April 2008. The program was found to be effectively implementing all NRC and industry requirements. Operating experience pertaining to Alloy 600 was found to be appropriately incorporated into program procedures.

In the fall 2010 Unit 1 refueling outage, a visual examination of the reactor vessel closure head was performed from under the insulation through multiple access points, as required by Code Case N-729. Results were acceptable. This examination is performed during every outage in which the enhanced bare-metal visual examination is not required.

As required, pre-service examinations of the pressurizer nozzle overlay welds were performed as a baseline. These examinations were performed prior to issuance of Code Case N-770-1 but meet the requirements of Table 1 and Section XI, Appendix VIII, and are therefore credited for Code Case compliance. In addition, SQN committed to the NRC in Request for Relief G-RR-1 to perform Unit 1 volumetric examinations in accordance with ASME Section XI, paragraph Q-4300(a) through (f) and Q-4310. This code section, and also ASME Code Case N-770-1, require the overlays to be reexamined in the first or second refueling outage following their installation. These required examinations of the pressurizer weld overlays were performed during the fall 2010 Unit 1 refueling outage. No indication of crack growth or new cracking was identified. Based on this history, the overlay welds are now inspected on a sample basis, as required for ASME Code Case N-770-1 Item Number "F" welds, at a rate of 25 percent per interval.

In the spring 2011 Unit 2 refueling outage, an enhanced bare-metal visual examination of the reactor vessel closure head and head penetrations was performed using a remote robotic camera. Results were acceptable. From this point on, a visual examination of the reactor vessel closure head is performed from under the insulation through multiple access points, as required by Code Case N-729, during every outage in which the enhanced bare-metal visual examination is not required.

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 history of 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 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 has been effective at identifying and managing aging effects of cracking for reactor coolant pressure boundary nickel alloy components and loss of material for susceptible components in the vicinity of the nickel alloy components. The Nickel Alloy Inspection Program provides reasonable assurance that the effects of aging are 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 CABLE CONNECTIONS

Program Description

The Non-EQ 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.

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 based on twenty 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 Cable Connections 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

This one-time inspection ensures that a potential aging effect (increased connection resistance) does not require a periodic aging management program. No site-specific operating experience was identified to indicate a need for a periodic aging management program, and this one-time inspection will confirm this for SQN. 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 SQN in other programs.

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. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 Cable Connections Program will be effective for managing the effects of aging since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ 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.1.25 NON-EQ INACCESSIBLE POWER CABLES (400 V TO 35 KV)

Program Description

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) Program is a new condition monitoring program that will manage the aging effect of reduced insulation resistance on inaccessible power (400 V to 35 kV) cables that have a license renewal intended function.

The cables to be included in this program are routed underground and are connected to the 6.9 kV yard area common board, the 6.9 kV shutdown boards, the 6.9 kV start buses (1B and 2B only), and the 480 V shutdown boards.

Non-EQ Underground Power Cable (400 V to 35 kV) Circuits That Require an AMP

Equipment ID	Voltage Level	Description
6.9 kV Start Buses		
0-BCTA-202-CL/1414	6900 V	6.9kV CSST “C” X-Winding MEB termination box to 6.9 kV Start Bus 2B
0-BCTA-202-CL/1418	6900 V	6.9kV CSST “C” Y-Winding MEB termination box to 6.9 kV Start Bus 1B
6.9 kV Yard Area Common Board		
0-BCTA-202-CY/19	6900 V	6.9 kV YD Area Comm BD to HPFP XFMR (0-XFA-201-EA/01)
0-BCTA-202-CY/1711	6900 V	Feeder from CSST D to the 6.9 kV YD Area Comm BD
6.9 kV Shutdown Boards		
1-BCTA-202-CM/6-A	6900 V	Shutdown Bd 1A-A Emergency Feeder from Diesel Generator 1A-A
SQN-0-MTRA-067-0460-A 0-BCTA-67-460-A	6900 V	ERCW Pump Q-A
SQN-0-MTRA-067-0432-A 0-BCTA-67-432-A	6900 V	ERCW Pump J-A
1-BCTA-202-CM/22-A	6900 V	To 480 V XFMR 1A-A at ERCW Pump Station
1-BCTA-202-CN/6-B	6900 V	Shutdown Bd 1B-B Emergency Feeder from Diesel Generator 1B-B

Non-EQ Underground Power Cable (400 V to 35 kV) Circuits That Require an AMP (Continued)

Equipment ID	Voltage Level	Description
SQN-0-MTRA-067-0452-B 0-BCTA-67-452-B	6900 V	ERCW Pump N-B
SQN-0-MTRA-067-0440-B 0-BCTA-67-440-B	6900 V	ERCW Pump L-B
1-BCTA-202-CN/22-B	6900 V	To 480 V XFMR 1B-B at ERCW Pump Station
2-BCTA-202-CO/6-A	6900 V	Shutdown Bd 2A-A Emergency Feeder from Diesel Generator 2A-A
SQN-0-MTRA-067-0436-A 0-BCTA-67-436-A	6900 V	ERCW Pump K-A
SQN-0-MTRA-067-0464-A 0-BCTA-67-464-A	6900 V	ERCW Pump R-A
2-BCTA-202-CO/22-A	6900 V	To 480 V XFMR 2A-A at ERCW Pump Station
2-BCTA-202-CP/6-B	6900 V	Shutdown Bd 2B-B Emergency Feeder from Diesel Generator 2B-B
SQN-0-MTRA-067-0444-B 0-BCTA-67-444-B	6900 V	ERCW Pump M-B
SQN-0-MTRA-067-0456-B 0-BCTA-67-456-B	6900 V	ERCW Pump P-B
2-BCTA-202-CP/22-B	6900 V	To 480 V XFMR 2B-B at ERCW Pump Station
480 V Shutdown Boards		
1-BCTB-201-DJ/11B-A	480 V	Feeder for 480 V Diesel Aux BD 1A1-A (NOR) & 1A2-A (ALT)
2-BCTB-201-DN/11B-A	480 V	Feeder for 480 V Diesel Aux BD 2A1-A (NOR) & 2A2-A (ALT)
1-BCTB-201-DK/11C-A	480 V	Feeder for 480 V Diesel Aux BD 1A2-A (NOR) & 1A1-A (ALT)
2-BCTB-201-DO/11C-A	480 V	Feeder for 480 V Diesel Aux BD 2A2-A (NOR) & 2A1-A (ALT)

Non-EQ Underground Power Cable (400 V to 35 kV) Circuits That Require an AMP (Continued)

Equipment ID	Voltage Level	Description
1-BCTB-201-DL/11B-B	480 V	Feeder for 480 V Diesel Aux BD 1B1-B (NOR) & 1B2-B (ALT)
2-BCTB-201-DP/11B-B	480 V	Feeder for 480 V Diesel Aux BD 2B1-B (NOR) & 2B2-B (ALT)
1-BCTB-201-DM/11B-B	480 V	Feeder for 480 V Diesel Aux BD 1B2-B (NOR) & 1B1-B (ALT)
2-BCTB-201-DQ/11B-B	480 V	Feeder for 480 V Diesel Aux BD 2B2-B (NOR) & 2B1-B (ALT)

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) 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). In this program, inaccessible power (400 V to 35 kV) 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. 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 for water accumulation in manholes at least once every year (annually). In addition to the periodic manhole inspections, manhole inspections for water after event-driven occurrences, such as flooding, will be performed. Inspection frequency will be increased as necessary based on evaluation of inspection results.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) 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.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

A review of plant-specific operating experience identified no age-related failures nor any aging mechanisms not considered in NUREG-1801.

Although sump pumps are installed in some manholes at SQN, unacceptable amounts of water have been found in some of them. This condition was documented in 2011 and 2012. The resultant corrective actions are expected to improve the capability to prevent water accumulation in manholes.

Proven, commercially available tests will be used for cable testing. As discussed in element 10 to 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; DG-1240; and NUREG/CR-7000. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 to 35 kV) Program will be effective at managing the effects of aging since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Inaccessible Power Cables (400 V to 35 kV) 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 INSTRUMENTATION CIRCUITS TEST REVIEW

Program Description

The Non-EQ 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.

- Neutron monitoring: excore power range
- Process radiation monitoring:
  - Containment building purge exhaust monitors
  - Fuel pool air space monitors
  - Main control room air intake monitors: emergency
  - Main control room air intake monitors: normal

The Non-EQ 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 ten 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 will occur at least once every ten 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 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 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

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. There is no operating experience at SQN involving age-related failures of neutron monitoring and high range radiation monitoring system cables and connections, and no aging mechanisms not considered in NUREG-1801 have been identified. Accordingly, there is reasonable assurance that this new aging management program will be effective during the period of extended operation.

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 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 Instrumentation Circuits Test Review Program will be effective for managing the effects of aging since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ 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.1.27 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. 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 equipment environment is a plant-specific condition that will be determined based on a plant spaces approach. The plant spaces approach provides for a review of all buildings and rooms in the scope of license renewal to determine potential adverse localized environments. The determination of a potential adverse localized equipment environment will be based on the most limiting temperature, radiation, or moisture conditions for the cables and connection insulation material located at SQN. The evaluation of an adverse localized equipment environment will be based on the most limiting temperature, radiation or moisture conditions for the cables and connection insulation material located within that plant space that has a potential adverse localized equipment environment.

This program will visually inspect accessible cables in an adverse localized environment at least once every ten 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 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 SQN 10 CFR 50 Appendix B quality assurance program.

As stated in NUREG-1801, Revision 2, Section XI.E1, industry operating experience has shown that adverse localized environments caused by heat/radiation/moisture for electrical cables and connections may exist near steam generators, pressurizers, or hot process pipes, such as feedwater lines. In this industry experience, such adverse localized environments have caused degradation of insulating materials on electrical cables and connections that is visually observable, such as color changes or surface cracking. These visual indications can indicate cable degradation. The examination techniques used in this program to detect aging effects are proven industry techniques that have been effectively used at SQN in other programs. Accordingly, there is reasonable assurance that this new aging management program will be effective during the period of extended operation.

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 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 will be effective for managing the effects of aging since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. 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.1.28 OIL ANALYSIS

Program Description

The Oil Analysis Program ensures that loss of material, cracking, and fouling are not occurring by maintaining the quality of 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 detrimental contaminants. Testing results indicating presence of water in oil samples initiate corrective action that may include evaluating for in-leakage. In addition, the Oil Analysis Program will include sampling and analysis of insulating oil.

The One-Time Inspection Program (Section B.1.29) utilizes 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, cracking and fouling.

NUREG-1801 Consistency

The Oil Analysis Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M39, Lubricating Oil Analysis.

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 the Program 2. Preventive Actions 3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitor and Trending	Revise Oil Analysis Program procedures to monitor and maintain contaminants in the 161-kV oil-filled cable system within acceptable limits through periodic sampling in accordance with industry standards, manufacturer's recommendations, and plant-specific operating experience.
6. Acceptance Criteria 7. Corrective Action	Revise Oil Analysis Program procedures to trend oil contaminant levels and initiate a problem evaluation report if contaminants exceed alert levels or limits in the 161-kV oil-filled cable system.

Operating Experience

An assessment of the program in 2001 found that during a two-year period there were no equipment failures that should have been prevented by Oil Analysis Program activities. The conclusion of the assessment was that the program was effective.

An oil sample taken in 2010 from a diesel generator bearing had a large step increase in iron, lead, copper, and tin. This was thought to potentially indicate wear metals from the generator bearing. An additional oil sample was taken after the next scheduled diesel engine run to validate this oil sample, and the results did not indicate the same materials. Vibration run data from the previous five monthly surveillance runs were reviewed, and it was concluded that none of the vibration data are indicative of generator bearing wear or degradation. This provided reasonable assurance that the most likely cause for the large step increase in iron, lead, copper, and tin for the earlier oil sample taken from standby DG 1A1 generator bearing was due to incorrectly taking the oil sample from the bottom of the bearing oil sump, which is not a representative oil sample.

Operating experience shows that the Oil Analysis Program is effective in managing aging effects on plant equipment by testing and monitoring of the machines in the plant that utilize lubricants. PERs and work orders are written to address negative trends and deficiencies. This ensures that the quality of lubricating oil is maintained, contaminants are kept within acceptable limits, and online failures are minimized.

The history of 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 Oil Analysis 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 Oil Analysis Program has been effective at identifying and managing aging effects of loss of material, cracking, and fouling of the internal surfaces of components exposed to lubrication oil. The Oil Analysis Program provides reasonable assurance that the effects of aging are 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.1.29 ONE-TIME INSPECTION

Program Description

The One-Time Inspection Program is a new program that consists of a one-time inspection of selected components to accomplish the following:

- Verify the effectiveness of AMPs 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 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.

Determination of the sample size will be based on 20 percent of the components in each material-environment-aging effect group up to a maximum of 25 components. The sample size of components to be inspected will also be based on an assessment of operating experience. 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. 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 following table identifies parameters monitored and inspection methods for specific aging effects.

Aging Effect	Aging Mechanism	Parameter(s) Monitored	Inspection Method
Loss of material	Crevice corrosions	Surface condition Wall thickness	Visual (VT-1 or equivalent) and/or volumetric (ultrasonic testing [UT])
Loss of material	Galvanic corrosion	Surface condition Wall thickness	Visual (VT-3 or equivalent) and/or volumetric (UT)
Loss of material	General corrosion	Surface condition Wall thickness	Visual (VT-3 or equivalent) and/or volumetric (UT)
Loss of material	Microbiologically influenced corrosion (MIC)	Surface condition Wall thickness	Visual (VT-3 or equivalent) and/or volumetric (UT)
Loss of material	Pitting corrosion	Surface condition Wall thickness	Visual (VT-1 or equivalent) and/or volumetric (UT)
Loss of material	Erosion	Surface condition Wall thickness	Visual (VT-1 or equivalent) and/or volumetric (UT)
Loss of material	Wear	Wall thickness	Eddy current
Reduction of heat transfer	Fouling	Surface condition	Visual (VT-3 or equivalent)
Cracking	SCC or cyclic loading	Surface condition	Enhanced visual (EVT-1 or equivalent) or surface examination (magnetic particle, liquid penetrant) or volumetric (radiographic testing or UT)

The program will include activities to verify effectiveness of aging management programs and activities to confirm the insignificance of aging effects as described below.

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 is not occurring.
Oil Analysis Program (Section B.1.28)	One-time inspection activity will verify the effectiveness of the Oil Analysis Program by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Water Chemistry Control Program (Section B.1.43)	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 fouling is not occurring.
Reactor vessel flange leak-off lines	One-time inspection activity will confirm that cracking and loss of material are not occurring or are so insignificant that an aging management program is not warranted.
Internal surfaces of the containment spray piping water seal area at water line region	One-time inspection activity will confirm that cracking is not occurring or is so insignificant that an aging management program is not warranted.
External surfaces of RHR heat exchanger tubes	One-time inspection activity will confirm that loss of material is not occurring or is so insignificant that an aging management program is not warranted.

The inspections will be performed within the ten years 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. 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 SQN 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to potential aging effects for which there is no operating experience at SQN 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 established industry techniques for inspection, such as UT 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.1.16) Programs. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 One-Time Inspection Program will be effective at identifying and managing aging effects of loss of material (including loss of material due to wear), reduction of heat transfer, and cracking, since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The One-Time Inspection Program provides reasonable assurance that the Water Chemistry Control, Diesel Fuel Monitoring, and Oil Analysis programs are effective in managing the effects of aging to ensure component intended functions will be maintained in accordance with the current licensing basis through the period of extended operation.

B.1.30 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. SQN 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 SQN has an extensive operating history, this program provides a one-time volumetric or opportunistic destructive inspection of a three percent sample or maximum of ten ASME Class 1 piping butt weld locations and a three percent sample or a maximum of ten 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 CAP 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-year period 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. 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 SQN 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to a potential aging effect (cracking of ASME Code Class 1 piping less than 4 inches nominal pipe size). There is no operating experience at SQN involving this aging effect. As stated in NUREG-1801, Revision 2, Section XI.M35, this program uses volumetric inspection techniques with demonstrated capability and a proven industry record to detect cracking in piping weld and base material. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 One-Time Inspection – Small-Bore Piping Program will be effective at identifying and managing the aging effect of cracking in ASME Class 1 small-bore piping, since it will incorporate proven inspection techniques, acceptance criteria, corrective actions, and administrative controls. The One-Time Inspection – Small-Bore Piping Program provides reasonable assurance that the effects of aging due to cracking 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 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance (PSPM) Program manages for specific components' aging effects not managed by other aging management programs, including loss of material, fouling, cracking, and change in material properties.

Credit for program activities has been taken in the aging management review of systems, structures and components as described below.

Reactor building	Pressure test the divider barrier seal test coupon, and manually flex and visually monitor the surface condition of elastomeric components related to the seal between the upper and lower compartments (divider barrier) to verify the absence of cracks, loss of material, and significant change in material properties.
161-kV oil-filled cable from CSST C to 161-kV switchyard breakers 944/948	Visually inspect the surface condition of the cable in the trench to verify there are no adverse localized equipment environments for this cable. Perform an insulation resistance test.
Standby diesel generator	Perform an EVT-1 visual inspection of the surface condition of a representative sample of aluminum valve bodies to verify the absence of cracking due to stress corrosion/IGA; perform an EVT-1 visual inspection of the surface condition of a representative sample of DG lube oil cooler heat exchanger tubes to manage loss of material due to wear; perform an EVT-1 visual inspection of the surface condition to monitor for cracks in the standby DG exhaust expansion joint.
Component cooling	Visually inspect the inside and outside surface of carbon steel spool piece exposed to air – indoor to manage loss of material. For carbon steel piping exposed to stagnant treated water > 130ºF, perform sample inspection using ultrasonic testing (UT) to ensure no cracks exceed minimum wall thickness requirements.
High pressure fire protection – water	Visually inspect the inside and outside surface condition of the carbon steel spool piece exposed to air – indoor to manage loss of material.
RCP oil collection	Visually inspect the inside surface condition of carbon steel RCP oil collection piping exposed to waste lube oil to manage loss of material.

Miscellaneous HVAC	For ESF room coolers, perform air flow testing to manage fouling for copper alloy tubes and fins. Perform an inspection of the heat exchanger (tubes) surface condition to manage loss of material. Perform an EVT-1 visual inspection of the surface condition of a representative sample of aluminum valve bodies to verify the absence of cracking due to stress corrosion/IGA. Visually inspect surface condition of fan housing and exhaust fan cover surface condition to manage loss of material.
Auxiliary controlled air system	Perform an air-side visual inspection of the surface condition of the after-cooler copper alloy tubes/fins for debris.
Chemical volume and control system	Perform a visual or NDE inspection of the surface condition of the charging pump mini-flow orifices for evidence of erosion.
Waste disposal	Use visual or other NDE techniques to inspect the surface condition of the stainless steel piping in the water line region in the containment floor and equipment sumps to manage the potential accelerated loss of material.
Essential raw cooling water	Visually inspect the inside and outside surface condition of the carbon steel spool pieces exposed to air – indoor to manage loss of material.
Nonsafety-related systems affecting safety-related systems	Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel main steam (System 001) piping and piping components, orifices, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of auxiliary boiler (System 012) heat exchangers (shell and bonnet), piping and piping components, pump casings, sight glasses, strainer housings, tanks, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of steam generator blow down (System 015) piping and piping components, pump casings, thermowells, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of stainless steel and carbon steel raw cooling water (System 024) cooler housings, piping and piping components, thermowells, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel and copper alloy > 15% zinc or > 8% aluminum ventilation (Systems 030, 031, 044, 300, 311, 312, 313) damper housings, duct, fan housings, piping, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel gland seal water (System 037) piping and pump casings to manage loss of material. (continued below)

Nonsafety-related systems affecting safety-related systems (continued)	Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel sampling and water quality (System 043) flow elements, piping and piping components, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of aluminum, carbon steel, and stainless steel demineralized water and cask decon system and demineralizer water storage and distribution system (System 059/959) heater housings, piping and piping components, tanks, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel chemical volume and control (System 062) condenser shells, cooler housings, demineralizers, ejectors, evaporators, filter housings, flow elements, heater housings, piping and piping components, pump casings, rupture discs, tanks, thermowells, traps, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel essential raw water (System 067) flow elements, piping and piping components, pump casings, thermowells, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel, copper alloy > 15% zinc or > 8% aluminum, and stainless steel component cooling (System 070) condenser shells, cooler shells, flow elements, piping and piping components, thermowells, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel waste disposal (System 077) condenser shells, cooler housings, demineralizers, ejectors, evaporators, filter housings, flow elements, heat exchanger shells, piping and piping components, pump casings, sight glasses, tanks, thermowells, traps, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of stainless steel primary water makeup (System 081) piping to manage loss of material. Visually inspect the internal surface condition of a representative sample of carbon steel and stainless steel upper head injection (System 087) piping and piping components, pumps, rupture discs, tanks, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of a representative sample of stainless steel radiation monitoring (System 090) valve bodies to manage loss of material. (continued below)

Nonsafety-related systems affecting safety-related systems (continued)	Visually inspect the internal surface condition of a representative sample of carbon steel, copper alloy > 15% zinc or > 8% aluminum, and stainless steel water treatment and makeup water treatment (Systems 028/928) flow elements, orifices, piping and piping components, pump casings, sight glasses, tanks, thermowells, traps, tubing, and valve bodies to manage loss of material. Visually inspect the internal surface condition of stainless steel station drainage and sewage (040/305) piping 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 SQN Periodic Surveillance and Preventive Maintenance Program monitors and inspects parameters linked to the degradation of the particular structure or component intended function.

4. **Detection of Aging Effects**

Preventive maintenance activities and periodic surveillances provide for periodic component inspections to detect aging effects. Inspection intervals are established such that they provide timely detection of degradation prior to loss of intended functions. Inspection intervals, sample sizes, and data collection methods are dependent on component material and environment and take into consideration industry and plant-specific operating experience and manufacturers' recommendations.

Established techniques such as visual inspections are used. Each inspection occurs at least once every five years. The selection of components to be inspected will focus on locations which are most susceptible to aging, where practical. Established inspection methods to detect aging effects include (1) visual inspections and manual flexing of elastomeric components and (2) visual inspections or other NDE techniques for metallic components. Inspections are performed by personnel qualified to perform the inspections.

For each activity 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

Preventive maintenance activities provide for monitoring and trending of aging degradation. Inspection 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 procedures confirm that the structure or component intended function(s) are maintained by verifying the absence of aging effects or by comparing applicable parameters to limits established by plant design basis.

Acceptance criteria include (1) for elastomer components, no significant change in material properties or cracking while visually observing and flexing components, and (2) for metallic components, no unacceptable loss of material such that component wall thickness remains above the required minimum.

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.

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

Typical inspection results of this program include the following from recent inspections and tests during periodic surveillance and preventive maintenance activities.

An inspection of internal surfaces of exhaust system in the standby diesel generator system was performed in 2009. The wall thickness was found to be acceptable.

Spool pieces for the component cooling water, essential raw water cooling, and high pressure fire protection water systems were satisfactorily inspected in 2009.

Portable fans for miscellaneous HVAC systems were satisfactorily inspected in 2011.

ESF room cooler air flow testing was performed satisfactorily in 2011.

The history of continued inspection and evaluation prior to loss of intended function provides reasonable assurance that the Periodic Surveillance and Preventive Maintenance 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.

Enhancements

The following enhancement 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 6. Acceptance Criteria	Revise PSPM Program procedures as necessary to include all activities described in the table provided in the program description.

Conclusion

The Periodic Surveillance and Preventive Maintenance Program has been effective at identifying and managing aging effects of loss of material, fouling, cracking, and change in material properties. The Periodic Surveillance and Preventive Maintenance Program provides reasonable assurance that the effects of aging are 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 PROTECTIVE COATING MONITORING AND MAINTENANCE

Program Description

The Protective Coating Monitoring and Maintenance Program monitors and maintains Service Level I coatings applied to carbon steel and concrete surfaces inside containment (e.g., steel containment vessel shell, structural steel, supports, penetrations, and concrete walls and floors). The program serves to prevent or minimize loss of material due to corrosion of carbon steel components and aids in decontamination. The program addresses accessible coated surfaces inside containment. The SQN program was developed based on the guidance contained in NRC RG 1.54, Revision 0; however, the program will be enhanced to meet the technical basis of Regulatory Position C4 in NRC RG 1.54, Revision 2, and ASTM D 5163-08. With these enhancements, 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 systems suction strainers, reducing flow through the system and possibly causing unacceptable head loss for the pumps.

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 Protective Coating Monitoring and Maintenance Program procedures to clarify that detection of aging effects will include inspection of coatings near sumps or screens associated with the emergency core cooling system.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Protective Coating Monitoring and Maintenance Program procedures to clarify that instruments and equipment needed for inspection may include, but not be limited to, flashlights, spotlights, marker pen, mirror, measuring tape, magnifier, binoculars, camera with or without wide-angle lens, and self-sealing polyethylene sample bags.
5. Monitoring and Trending	Revise Protective Coating Monitoring and Maintenance Program procedures to clarify that the last two performance monitoring reports pertaining to the coating systems will be reviewed prior to the inspection or monitoring process.

Operating Experience

A 2009 assessment identified some gaps in the implementation of the Protective Coating Monitoring and Maintenance Program. The assessment resulted in the identification of areas for improvement.

- The program owner did not have either of the coatings-related qualification cards, and there was no documented development plan in place or contingency plan for how coatings issues requiring a qualified program owner were to be addressed. Actions taken include assignment of an individual and back-up program engineer, identification and funding of critical skills training, and planning for attrition by developing skills and knowledge of new engineers through cross-training.

- Several exceptions to the coatings specification were not properly approved and documented. Actions were completed to approve and properly document the exceptions.

- The SQN uncontrolled coatings logs were not being maintained in a timely manner. Actions were taken to revise the site calculations to update the Unit 1 and Unit 2 uncontrolled coatings logs as required by procedure.

- Outage coating condition assessments and coatings work logs are not being documented, distributed, and reviewed in accordance with specification requirements. Actions were completed to update the applicable tasks to specifically identify the specification requirements.

- Applicator qualification was not being performed and documented in accordance with the coatings specification. Recent qualification records were reviewed and found incomplete. There was no documented evidence that written exams are administered as part of the applicator qualification process. Actions were taken to verify qualification requirements identified in site procedures are equivalent to coatings specification requirements and that painters are familiar with the requirements.

- The coatings specification required revision to provide additional guidance and fleet standardization for coating data collection and recording practices for applied safety-related coatings. Action was completed to revise the coatings specification to incorporate additional guidance and standard data sheets.

The assessment noted that SQN site engineering has taken a more active role in recent coatings work. For example, when an issue was identified with the fuel oil storage tank coating, site engineering actively participated in selecting the appropriate approved coating for this application, including contacting the coating manufacturer and industry peers. In addition, site engineering took a more active role in ensuring that qualifying agents designation is in accordance with the intent of the coatings specification.

Per the corporate coatings specification, containment inspections are performed every refueling outage. Inspection reports were reviewed from spring 2008 (Unit 2), spring 2009 (Unit 1), fall 2009 (Unit 2), fall 2010 (Unit 1), and spring 2011 (Unit 2). There were no indications of coating failures.

As discussed in element 10 to NUREG-1801, Section XI.S8, this program considers the technical information and industry operating experience provided in NRC IN 88-82, NRC Bulletin 96-03, NRC GL 04-02, GL 98-04, and NRC RG 1.54, Rev. 1.

The history of 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 Protective Coating Monitoring and Maintenance 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 Protective Coating Monitoring and Maintenance Program has been effective at identifying and managing the aging effect of loss of coating integrity of steel and concrete components or commodities having coating surfaces. The Protective Coating Monitoring and Maintenance Program provides reasonable assurance that the effects of aging are 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 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, nuts and threads in flange) 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 except one, which has yield strength of 150.7 ksi. 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 7. Corrective 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 ksi.
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 to refer to Reg. Guide 1.65, Rev. 1.

Operating Experience

Inspection methods are visual and ultrasonic techniques that have demonstrated effectiveness for this application. Reactor head closure studs, washers, and nuts examined between 2003 and 2011 for Unit 1 had no relevant indications. Reactor head closure studs, washers, and nuts examined between 2005 and 2011 for Unit 2 had no relevant indications. This included the results of magnetic particle or liquid penetrant examinations to indicate the presence of surface discontinuities and flaws, as well as radiographic or ultrasonic examinations to indicate the presence of discontinuities or flaws throughout the volume of material.

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.

The history of inspection for degradation provides reasonable assurance that the Reactor Head Closure Studs 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 Head Closure Studs Program has been effective at identifying and managing aging effects loss of material and cracking of reactor closure stud assemblies. The Reactor Head Closure Studs Program provides reasonable assurance that the effects of aging are 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 INTERNALS

Program Description

The Reactor Vessel Internals Program includes reactor vessel internal components for SQN Unit 1 and Unit 2, which are Westinghouse NSSS design, with the exception of fuel assemblies, reactivity control assemblies, nuclear instrumentation, and welded attachments to the reactor vessel. The program performs the following: (1) manages cracking, loss of material, reduction of fracture toughness, change in dimension, and loss of preload for reactor vessel internal components intended to provide core support; (2) implements the guidance of EPRI 1022863 (MRP-227-A), including the plant-specific action items, conditions and limitations identified in the NRC SE (Rev. 1) for MRP-227, which are addressed in Appendix C; (3) implements the guidelines of EPRI 1016609 (MRP-228); (4) incorporates "acceptance criteria" recommendations from Section 3.1.2.2 of NUREG-1800; (5) discusses how to disposition nonconforming reactor vessel internals components; (6) incorporates the definition of sampling-based condition monitoring found in NRC Branch Technical Position RSLB-1; and (7) uses a four-step ranking process (i.e., primary, expansion, existing, and no additional measure components).

The result of the four-step sample selection process is a set of primary internals component locations for the SQN reactor vessel internals design that are expected to show leading indications of the degradation effects, with another set of expansion internals component locations that are specified to expand the sample should the indications be more severe than anticipated. The degradation of the third set of internals locations are deemed to be adequately managed by existing programs, such as ASME Code Section XI Examination Category B-N-3, examinations of core support structures. A fourth set of internal locations 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. For further information, see the tables in Appendix C.

In 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.

The program uses inspection techniques consistent with MRP-227-A and MRP-228.

NUREG-1801 Consistency

The Reactor Vessel Internals Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M16A, PWR Vessels Internals Program as revised by Draft LR ISG-2011-04.

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 Reactor Vessel Internals Program procedures to take physical measurements of the Type 304 stainless steel hold-down spring in Unit 1 at each refueling outage to ensure preload is adequate for continued operation.
6. Acceptance Criteria	Revise Reactor Vessel Internals Program procedures to include preload acceptance criteria for the Type 304 stainless steel hold-down spring in Unit 1.

Operating Experience

Control rod guide tube flexure cracks discovered in domestic and foreign plants were applicable operating experience for SQN. Augmented examinations of the affected areas were conducted during the second 10-year ISI inspection interval vessel interior examination when the core barrel was removed; no indications were observed. Design changes to mitigate these potential aging effects were installed at Unit 1 in 2001 and at Unit 2 in 2002.

The accessible portions of the interior of the reactor vessels are inspected each ISI period. The most recent exams (2009 for both Unit 1 and Unit 2) found no unacceptable indications.

TVA has participated in the development of MRP-227, an industry-wide effort to use operating experience from all Westinghouse reactors to develop inspection requirements for reactor vessel internals.

All inspections performed to date at SQN have been conducted per the examination requirements of ASME Section XI. Section 7.3 of MRP-227-A provides implementation requirements for reactor vessel internals. These guidelines do not reduce, alter, or otherwise affect current ASME Section XI or plant-specific licensing inservice inspection requirements.

As discussed in element 10 to NUREG-1801, Section XI.M16A, this program considers the technical information and industry operating experience provided in Nuclear Energy Institute (NEI) 03-08 and MRP-227-A.

The history of inspection for degradation, along with identification of program deficiencies and subsequent corrective actions, provide reasonable assurance that the Reactor Vessel Internals 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 Internals Program has been effective at identifying and managing aging effects change in dimension, cracking, loss of preload, reduction in fracture toughness, and loss of material for reactor vessel internal components. The Reactor Vessel Internals Program provides reasonable assurance that the effects of aging are 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 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. In addition, the program will consider reduction in fracture toughness and long-term operating conditions for the area outside the beltline.

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) determine the need for operating restrictions on the inlet temperature, neutron spectrum, and neutron flux. 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.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance.

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 the Program 5. Monitoring and Trending	Revise Reactor Vessel Surveillance Program procedures to consider the area outside the beltline such as nozzles, penetrations and discontinuities to determine if more restrictive pressure-temperature limits are required than would be determined by just considering the reactor vessel beltline materials.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Reactor Vessel Surveillance Program procedures to develop an NRC-approved schedule for capsule withdrawals to meet ASTM-E185-82 requirements, including the possibility of operation beyond 60 years.
5. Monitoring and Trending	Revise Reactor Vessel Surveillance Program procedures to withdraw and test a standby capsule to cover the peak fluence expected at the end of the period of extended operation.

Operating Experience

The fourth surveillance capsule on each unit was removed during the Unit 1 refueling outage in fall 1998 and Unit 2 refueling outage in spring 1999. The examination results from these capsules indicate that all reactor vessel beltline materials have an upper shelf energy level in excess of 50 ft-lb for exposures projected to the end of the original plant license term (32 EFPY).

From the results of the capsule analysis, the RCS heat-up and cool-down limits reflected in the plant pressure-temperature limits report (PTLR) were generated. To minimize the impact of beltline material aging effects on heat-up and cool-down operating margins, ASME Code Case N-640 (which allows for the application of a reduced stress intensification factor in establishing the heat-up and cool-down limits) was applied. Application of the code case effectively allowed an extension of the applicability of the RCS heat-up and cool-down limits calculated for 16 EFPY of operation to 32 EFPY of operation without the loss of any operational margin.

The history of analysis and projection 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 has been effective at identifying and managing the aging effect of reduction in fracture toughness. The Reactor Vessel Surveillance Program provides reasonable assurance that the effects of aging are 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 RG 1.127, INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

Program Description

SQN is not committed to the requirements of NRC RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants." However, the program at SQN was developed based on guidance provided in the NRC RG 1.127, Revision 1, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," and provides an inservice inspection and surveillance program for the SQN slopes, channels and raw water-control structures associated with emergency cooling water systems or flood protection. The scope of the SQN program includes water-control structures within the scope of license renewal as delineated in 10 CFR 54.4. The SQN program addresses age-related deterioration, degradation due to extreme environmental conditions, and the effects of natural phenomena that may affect water-control structures. The program requires periodic monitoring and maintenance of water-control structures so that the consequences of age-related deterioration and degradation can be prevented or mitigated in a timely manner. The program will be implemented as part of the Structures Monitoring Program (Section B.1.40).

The program provides guidance on engineering data compilation, inspection activities, technical evaluation, inspection frequency, and the content of inspection reports. Inspections of water-control structures are conducted by or under the direction of qualified engineers experienced in the investigation, design, construction, and operation of the structures. Inspections are conducted systematically using checklists and other documents as required to minimize the possibility of overlooking significant features. Technical evaluations are performed if observed degradations have the potential for impacting the intended function of the water-control structures.

NUREG-1801 Consistency

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, with enhancements, will be consistent with the program described in NUREG-1801, Section XI.S7, RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants.

Exceptions to NUREG-1801

None

Enhancements

Enhancements to this program are included in the enhancements to the Structures Monitoring Program (Section B.1.40).

Operating Experience

A baseline inspection of the ERCW pumping station and discharge box was completed from 1996 to 1999 as part of the SQN Maintenance Rule Program. The baseline inspection identified the following defects.

- Cracks in wall of two pump bays with some in-leakage were noted. The defects were characterized as acceptable. These conditions are re-inspected during follow-up inspections.
- Four ceiling cracks were identified in the ERCW pumping station. These cracks were characterized as acceptable and are monitored for growth during follow-up inspections.
- Wall cracking was identified. The apparent cause was thermal contraction of a steel roof support beam. This defect was characterized as "acceptable with deficiencies" and was subsequently corrected with a design change.
- Concrete spalling was observed on the underside of a concrete roof slab. The spall was not deep enough to expose reinforcing bar and was determined to meet Code having no adverse effect on slab strength. This defect was characterized as acceptable with no repair needed. This defect is monitored during follow-up inspections.

Follow-up inspections were completed in 2002, 2006, and 2007. No additional defects or changes to existing "open" defects were identified during the re-inspection of the CCW intake structure, ERCW pumping station, and discharge box. All defects were identified, evaluated, corrected or monitored as necessary.

During the NRC ultimate heat sink inspection in August 2009, concrete spalls were identified on the bottom of the concrete slab associated with the hydraulic crane boom support on the roof of the ERCW intake structure. This condition had been identified during a structural inspection in 1996 and is being monitored.

Per program guidance for inspection of ponds, channels, and dikes, a series of surveys, photographs, and observations began at SQN in August 1999 to establish documentation of the condition of ponds, dikes, and channels. This provides methods to baseline their condition and to quantify changes that may occur in these features as the result of an unusual event or slowly occurring, long-term changes. The first five-year interval inspection of ponds, dikes, and channels was completed in 2004, including inspections of the CCW pumping station intake channel, ERCW intake channel and dike, skimmer wall, and skimmer wall dike. As identified in the inspection report, the skimmer wall dike and CCW intake channel had little erosion when compared to the 1999 inspection. Also the CCW intake channel and ERCW intake channels were inspected for silting and were found to have very little increase in silting compared to earlier inspections. There was no abnormal cracking observed on the ERCW dike. No other findings were observed with respect to the water-control structures in the RG 1.127 program.

The second five-year interval inspection of ponds, dikes, and channels was completed in 2009, including inspections of the CCW pumping station intake channel, ERCW intake channel and dike, skimmer wall, and skimmer wall dike. As a result of these inspections, the following findings were identified.

- CCW intake channel: Some minor erosion was identified, and several small shrubs, bushes, and trees were noted on the interior slopes of the channel. Otherwise, the slopes had an adequate cover of riprap and appeared to be stable. Increasing erosion was not found, and thus no action was needed to stabilize the area. The inspection revealed no issues concerning settlement, seepage, obstructions, or embankment-structure interfaces. No issues concerning the integrity of the CCW intake channel were visible during this inspection. Skimmer wall dike repairs performed in 1999 exceeded design requirements, and the dike was in excellent condition.
- ERCW protective dike: The inspection revealed no issues concerning settlement, slope stability, seepage, obstructions, or embankment-structure interfaces. No issues concerning the integrity of the ERCW dike were visible during this inspection.

The results of the 1999, 2004 and 2009 inspections indicate that the CCW pumping station intake channel, ERCW intake channel and dike, skimmer wall, and skimmer wall dike are in good condition and are monitored appropriately.

As discussed in element 10 to NUREG-1801, Section XI.S7, this program considers the technical information and industry operating experience provided in NRC RG 1.127 and NUREG-1522.

The history of 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants 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 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program has been effective at identifying and managing the aging effects of loss of material of steel components; cracking, increase in porosity and permeability, loss of bond, loss of material, and loss of strength of concrete components; and loss of form, loss of material, and change in material properties of riprap and earthen and rock embankments associated with water-control structures. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program provides reasonable assurance that the effects of aging are 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 SELECTIVE LEACHING

Program Description

The Selective Leaching Program is a new program that 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 exposed to raw water, waste water, treated water, or ground water. A sample population is defined as components with the same material and environment combination. The sample population will focus on bounding or leading components most susceptible to aging due to time in service, severity of operating condition, and lowest design margin. The program includes 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.

Follow-up for unacceptable inspection findings includes an evaluation using the CAP and possible expansion of the inspection sample size and location.

This inspection will be performed within the five years 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.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Selective Leaching 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to potential aging effects for which there is no operating experience at SQN indicating the need for an aging management program. The review of operating experience at SQN 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 and will be effective in managing the aging effect included in this program. Accordingly, there is reasonable assurance that this new aging management program will be effective during 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 Selective Leaching Program will be effective at identifying and managing the aging effect of loss of material due to selective leaching, since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. 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.1.38 SERVICE WATER INTEGRITY

Program Description

The Service Water Integrity Program manages loss of material and fouling for components fabricated from carbon steel, carbon steel clad with stainless steel, cast iron, copper alloy, nickel alloy, and stainless steel exposed to ERCW as described in the SQN response to NRC GL 89-13. The program includes (a) surveillance and control techniques to manage effects of biofouling, corrosion, erosion, coating failures, 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; and (d) routine inspections and maintenance.

NUREG-1801 Consistency

The Service Water Integrity Program is consistent with the program described in NUREG-1801, Section XI.M20, Open-Cycle Cooling Water System.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

TVA performs quarterly testing using ultrasonic inspections of the raw cooling water (RCW) and ERCW systems. Results are documented in a database for trending corrosion rates of piping. Areas chosen for inspection include low flow and stagnant piping regions. UT scans are used with a gridding process. There are approximately 150 grids on RCW and ERCW system piping, concentrating on low flow and stagnant areas.

An assessment of raw water corrosion and MIC monitoring in 2005 found that the electronic sketches and UT data recorded in the raw water trending database allow a user-friendly approach for defining inspection points. Industry operating experience was obtained through observations and recommendations from industry peers.

A raw water management assessment in 2006 found that performance in macro-fouling chemical application and control had improved at SQN. The "raw water team" was effectively monitoring the programs, and cooperation between functional groups had improved, leading to more efficient and economical non-oxidizing biocide treatments. The ERCW treatment skid had been recently reconfigured to allow both the oxidizing biocide and the corrosion control chemistry to be fed simultaneously. However, evaluations of equipment that was not treated and inadequate equipment treatment rotations were still areas for improvement. It was also found that microbiological testing had not been adequate in the past. These issues were resolved using the CAP.

In 2006, it was noted that the procedure for ERCW system manipulation of plant activities did not contain sufficient details to treat or flush certain piping deadlegs. The procedure was revised.

A review of the corrosion control procedure in 2006 identified that sufficient guidance was not provided for testing frequency or when testing should be performed to monitor for MIC. Industry specialists on MIC surveillance were interviewed and provided the recommendations to focus on low flow areas, which are most susceptible. This procedure deficiency was corrected.

A 2009 assessment of ongoing actions taken in response to GL 89-13 found that thermal performance of the containment spray heat exchangers, visual inspections for bio-fouling, silt, and corrosion products, and layup of containment spray heat exchangers with demineralized water were not being performed in accordance with GL 89-13 commitments. These issues were resolved using the CAP.

An assessment of raw water/MIC monitoring and trending in 2009 found an increasing trend in the number of leaks in the ERCW system. Based on this assessment, procedures were revised to provide more comprehensive guidance on monitoring systems susceptible to MIC, reinforce differences in MIC degradation in carbon steel versus stainless steel, and define organizational responsibilities.

SQN has implemented a raw water pipe replacement project based on a combination of the "Sequoyah Raw Water Corrosion Program" susceptibility study and internal operating experience. Schedules for piping replacement are periodically updated to reflect recent operating experience and results of UT inspections.

A 2011 assessment of ongoing actions taken in response to GL 89-13 verified the completion of the five implementing actions of GL 89-13. This assessment reviewed GL 89-13 inspections, testing, and work verifications including inspection of the ERCW intake structure, sounding of the ERCW (to monitor for silt buildup), ERCW chemical injections, testing of motor-operated valves and air-operated valves, periodic flow testing of ERCW, travelling screen integrity verification, thermal performance testing of the component cooling heat exchangers, visual and eddy current testing, inspections performed on ERCW-cooled heat exchangers (for MIC, corrosion, erosion, clams and mussels, silting, protective coating failures, and biofouling), verification of service water system intended function, and confirmation that maintenance practices, operating and emergency procedures, and training are adequate to ensure that safety-related equipment cooled by service water will function as intended.

In March 2011 during the annual inspection of an ERCW heat exchanger raw water side, live Asiatic clams were found. Based upon this operating experience, SQN initiated plans to modify the chemical injection system design and install new, more reliable chemical pumps. A plan has been presented to the plant health subcommittee to inject a different chemical that would be more effective in killing clams. Also, the frequency of injection will be changed from a batch injection to round-the-clock injection.

Based on plant operating experience, raw water system inspections are performed by a qualified individual to determine the extent of fouling or other deposits whenever piping and equipment is opened for maintenance or modifications.

Quarterly meetings are held to discuss status of service water systems. The participants include the program owner, the 89-13 engineer, chemistry, the ERCW system engineer, and the raw cooling water system engineer.

A 2012 self-assessment evaluated the effectiveness of the GL 89-13 program at SQN. Of the five implementing actions required for the GL 89-13 program and reviewed in this assessment, no deficiencies were noted.

An NRC triennial heat sink inspection was conducted in July 2012. The NRC review included the component cooling system (CCS), containment spray system (CS), residual heat removal system (RHR), and diesel generator (DG) jacket water heat exchangers. Walkdowns were conducted for the ERCW intake structure and CCS, CS, RHR and DG heat exchangers. Additionally, documentation associated with testing and maintenance for the above heat exchangers, including system health reports, calculations, CAP documents, and GL 89-13 commitments, were reviewed. No findings of regulatory significance were identified.

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 history of 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 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 Service Water Integrity Program has been effective at identifying and managing aging effects of loss of material (including loss of material due to wear), and fouling for components exposed to ERCW. The Service Water Integrity Program provides reasonable assurance that the effects of aging are 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 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 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 (Section B.1.43). 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 condition of components (e.g., plugs when installed, sleeves, and other secondary side components) is monitored visually. In the event degradation is noted, the CAP 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, with enhancement, will be consistent with the program described in NUREG-1801, Chapter XI.M19, Steam Generator Tube Integrity.

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 Steam Generator Integrity Program procedures to ensure that corrosion resistant materials are used for replacement steam generator tube plugs.

Operating Experience

Industry experience with steam generator design and manufacture described in LER 2012-001-00, "San Onofre Unit 3 Trip due to Steam Generator Tube Leak," and the associated NRC Augmented Inspection Team Report was reviewed. The activities performed to manage aging effects for the SQN steam generator components under the Steam Generator Integrity Program were found sufficient for the detection of degradation described in these industry documents.

An overview of operating experience for the Unit 1 replacement steam generators installed in 2003 and the Unit 2 original steam generators replaced in 2012 is as follows.

- Unit 1 Steam Generators (Replacement)

  The Unit 1 steam generators with mill-annealed Alloy 600 tubing were replaced in 2003. The replacement steam generators (RSGs) with thermally treated Alloy 690 tubing have undergone three inservice inspections. A total of 33 tubes have been plugged in the RSGs. This includes 20 tubes plugged during preservice inspections primarily due to potential wear concerns related to broken lock bars identified during pre-shipment inspections. Only 13 tubes have been plugged due to inservice degradation (i.e., anti-vibration bar [AVB] wear and tube support wear) over six cycles of operation.

- Unit 2 Steam Generators (Original)

  As of the last inservice inspection, 737 tubes had been plugged, which represents 5.4 percent of the total tubes. In 2012, SQN replaced the Unit 2 steam generators with steam generators using thermally treated Alloy 690 tubing.

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 history of 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 has been effective at identifying and managing aging effects of cracking and loss of material for steam generator components. The Steam Generator Integrity Program provides reasonable assurance that the effects of aging are 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.1.40 STRUCTURES MONITORING

Program Description

The SQN Structures Monitoring Program is an existing program that provides for aging management of 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 scope of the program also includes the condition monitoring of masonry walls and water-control structures as described in the Masonry Wall Program (Section B.1.20) and in the NRC RG 1.127, "Inspection of Water-Control Structures Associated with Nuclear Power Plants," aging management program (Section B.1.36).

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." Masonry walls are inspected for cracking. Elastomers will be monitored for hardening, shrinkage and a loss of sealing. Earthen structures will be inspected for loss of material and loss of form. 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 and loose or missing nuts and bolts. The program is augmented by existing plant procedures 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. These procedures include the guidance of EPRI TR-104213, NUREG-1339, and EPRI NP-5769 to ensure proper specification of bolting material, lubricant, and installation torque.

Inspection frequency is at least once every five years. 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 be enhanced to perform periodic sampling and chemical analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of five years to ensure that the ground water does not become aggressive, and if a change in the ground water chemistry occurs, prompt corrective actions will be taken in accordance with the plant CAP.

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 that 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 Structures Monitoring Program procedures to include the following in-scope structures: • Carbon dioxide building • Condensate storage tanks' (CSTs) foundations and pipe trench • East steam valve room Units 1 & 2 • Essential raw cooling water (ERCW) pumping station • High pressure fire protection (HPFP) pump house and water storage tanks' foundations • Radiation monitoring station (or particulate iodine and noble gas station) Units 1 & 2 • Skimmer wall (Cell No. 12) • Transformer and switchyard support structures and foundations

Element Affected	Enhancement
1. Scope of Program (cont.)	Revise Structures Monitoring Program procedures to specify the following list of in-scope structures are included in the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program (Section B.1.36): • Condenser cooling water (CCW) pumping station (also known as intake pumping station) and retaining walls • CCW pumping station intake channel • ERCW discharge box • ERCW protective dike • ERCW pumping station and access cells • Skimmer wall, skimmer wall Dike A and underwater dam Revise Structures Monitoring Program procedures to include the following in-scope structural components and commodities: • Anchor bolts • Anchorage/embedments (e.g., plates, channels, unistrut, angles, other structural shapes) • Beams, columns and base plates (steel) • Beams, columns, floor slabs and interior walls (concrete) • Beams, columns, floor slabs and interior walls (reactor cavity and primary shield walls; pressurizer and reactor coolant pump compartments; refueling canal, steam generator compartments; crane wall and missile shield slabs and barriers) • Building concrete at locations of expansion and grouted anchors; grout pads for support base plates • Cable tray • Cable tunnel • Canal gate bulkhead • Compressible joints and seals • Concrete cover for the rock walls of approach channel • Concrete shield blocks • Conduit • Control rod drive missile shield • Control room ceiling support system

Element Affected	Enhancement
1. Scope of Program (cont.)	• Curbs • Discharge box and foundation • Doors (including air locks and bulkhead doors) • Duct banks • Earthen embankment • Equipment pads/foundations • Explosion bolts (E. G. Smith aluminum bolts) • Exterior above and below grade; foundation (concrete) • Exterior concrete slabs (missile barrier) and concrete caps • Exterior walls: above and below grade (concrete) • Foundations: building, electrical components, switchyard, transformers, circuit breakers, tanks, etc. • Ice baskets • Ice baskets lattice support frames • Ice condenser support floor (concrete) • Intermediate deck and top deck of ice condenser • Kick plates and curbs (steel inside steel containment vessel) • Lower inlet doors (inside steel containment vessel) • Lower support structure structural steel: beams, columns, plates (inside steel containment vessel) • Manholes and handholes • Manways, hatches, manhole covers, and hatch covers (concrete) • Manways, hatches, manhole covers, and hatch covers (steel) • Masonry walls • Metal siding • Miscellaneous steel (decking, grating, handrails, ladders, platforms, enclosure plates, stairs, vents and louvers, framing steel, etc.) • Missile barriers/shields (concrete) • Missile barriers/shields (steel) • Monorails • Penetration seals • Penetration seals (steel end caps) • Penetration sleeves (mechanical and electrical not penetrating primary containment boundary) • Personnel access doors, equipment access floor hatch and escape hatches

Element Affected	Enhancement
1. Scope of Program (cont.)	• Piles • Pipe tunnel • Precast bulkheads • Pressure relief or blowout panels • Racks, panels, cabinets and enclosures for electrical equipment and instrumentation • Riprap • Rock embankment • Roof or floor decking • Roof membranes • Roof slabs • RWST rainwater diversion skirt • RWST storage basin • Seals and gaskets (doors, manways and hatches) • Seismic/expansion joint • Shield building concrete foundation, wall, tension ring beam and dome: interior, exterior above and below grade • Steel liner plate • Steel sheet piles • Structural bolting • Sumps (concrete) • Sump liners (steel) • Sump screens • Support members; welds; bolted connections; support anchorages to building structure (e.g., non-ASME piping and components supports, conduit supports, cable tray supports, HVAC duct supports, instrument tubing supports, tube track supports, pipe whip restraints, jet impingement shields, masonry walls, racks, panels, cabinets and enclosures for electrical equipment and instrumentation) • Support pedestals (concrete) • Transmission, angle and pull-off towers • Trash racks • Trash racks associated structural support framing • Traveling screen casing and associated structural support framing • Trenches (concrete) • Tube track • Turning vanes • Vibration isolators

Element Affected	Enhancement
1. Scope of Program (cont.)	Revise Structures Monitoring Program procedures to specify masonry walls located in the following in-scope structures are in the scope of the Masonry Wall Program: • Auxiliary building • Reactor building Units 1 & 2 • Control bay • ERCW pumping station • HPFP pump house • Turbine building
1. Scope of Program 3. Parameters Monitored or Inspected 4. Detection of Aging Effects	Revise Structures Monitoring Program procedures to include periodic sampling and chemical analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every five years.
3. Parameters Monitored or Inspected	Revise Structures Monitoring Program procedures to include the following parameters to be monitored or inspected: • Requirements for concrete structures based on ACI 349-3R and ASCE 11 and include monitoring the surface condition for 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. • Loose or missing nuts for structural bolting. • Monitoring gaps between the structural steel supports and masonry walls that could potentially affect wall qualification. Revise Structures Monitoring Program procedures to include the following components to be monitored for the associated parameters: • Anchors/fasteners (nuts and bolts) will be monitored for loose or missing nuts and/or bolts, and cracking of concrete around the anchor bolts. • Elastomeric vibration isolators and structural sealants will be monitored for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening).

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Structures Monitoring Program procedures to include the following for detection of aging effects: • Inspection of structural bolting for loose or missing nuts. • Inspection of anchor bolts for loose or missing nuts and/or bolts, and cracking of concrete around the anchor bolts. • Inspection of elastomeric material for cracking, loss of material, loss of sealing, and change in material properties (e.g., hardening), and supplement inspection 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 ten percent of available surface area. • Opportunistic inspections when normally inaccessible areas (e.g., high radiation areas, below-grade concrete walls or foundations, buried structures) become accessible due to required plant activities. Additionally, inspections will be performed of inaccessible areas in environments where observed conditions in accessible areas exposed to the same environment indicate that significant degradation is occurring. • Inspection of submerged structures at least once every five years. • Inspections of water control structures which should be conducted under the direction of qualified personnel experienced in the investigation, design, construction, and operation of these types of facilities. • Inspections of water control structures on an interval not to exceed five years. • Performance of special inspections of water control structures immediately (within 30 days) following the occurrence of significant natural phenomena, such as large floods, earthquakes, hurricanes, tornadoes, and intense local rainfalls.

Element Affected	Enhancement
6. Acceptance Criteria	Verify acceptance criteria in Structures Monitoring Program procedures is based on information provided in industry codes, standards, and guidelines including NEI 96-03, ACI 201.1R-92, ANSI/ASCE 11-99 and ACI 349.3R-02. Industry and plant-specific operating experience will also be considered in the development of the acceptance criteria.

Operating Experience

Baseline inspections of plant structures were completed from 1996 to 1999. Structures were examined for cracks, gaps, groundwater in-leakage, and other discrepancies. Follow-up inspections are performed on a five-year cycle and were completed in 2002, 2006, and 2007. During each follow-up inspection interval, a general walkdown is performed and all previous defects tracked as "open" are re-inspected. When it is confirmed that a defect has been repaired, the defect may either be closed or left open so that it may be monitored. In other cases, a defect may have been accepted without the need for repair. This defect may either be closed or monitored as deemed appropriate. Defects identified by the program were evaluated, corrected, or planned for correction.

Some defects were evaluated and classified as acceptable. This classification means that the structure is free of deficiencies or degradation which could lead to possible failure. The following acceptable defects remain "open" so that the condition will be monitored.

- AB0-005 (concrete spall)
- AB0-006 (rusty anchor bolts and baseplates)
- AB0-007 (support anchor bolts baseplates rusted)
- AB0-008 (roof coating peeling, ponding of water)
- AB0-015 (roof leaks)
- AB-017 (transfer canal liner leak)
- DG0-003 (surface corrosion of embedded plate and hanger support)
- TB0-009 (grout missing beneath baseplate)
- RB1-004 (moisture on floor slab)
- RB1-007 (concrete wall voids)
- RB1-008 (ceiling cracks)

Other acceptable defects were repaired or corrected such that no further monitoring is necessary. These "closed" defects include the following.

- AB0-010 (door gap seal repair needed)
- AB0-012 (ungrouted baseplate)
- AB0-013 (pigeon exclusion fence damaged)

- DG0-002 (loose anchor bolt)
- RB1-001 (boron leak)
- RB1-006 (wall cracks)
- RB2-001 (boron leaks)
- RWST1-001 (water ponding)
- RWST2-001 (water ponding)
- S/YRD-001 (cracked grout under baseplate)
- TB0-002 (roof leakage)
- TB0-003 (seals missing)
- TB0-004 (inadequate support)
- TB0-005 (loose stud)
- TB0-006 (seal missing)
- TB0-007 (grout cracked, loose anchor bolts)

Other defects were classified as acceptable with deficiencies. This classification means that deficiencies or degradation exist, but the structure is capable of performing its function. The following "acceptable with deficiencies" defects remain "open" in the program so that the condition will be monitored.

- AB0-001(ground water in-leakage)
- AB0-018 (deformation of railway hatch)
- CB0-001 (water in-leakage)
- RB1-009 (wall cracking, spalling)
- TB0-001 (ground water in-leakage).

Other "acceptable with deficiencies" defects have been repaired such that no further monitoring is necessary. These "closed" defects include the following.

- AB0-002 (UHI Pit - Ground water in-leakage)
- AB0-003 (damaged door rim locks)
- AB0-004 (roof cracking)
- AB0-016 (door/door seal damage)
- RB1-003 (boron leakage, support structure rust)
- RB2-002 (boron leakage, support structure rust)
- TB0-008 (vibration)

The program defines an unacceptable classification for degradation or deficiencies that are unacceptable or could degrade to an unacceptable condition if not analyzed or corrected prior to the next scheduled examination. The SQN Structures Monitoring Program has not identified any unacceptable deficiencies.

As discussed in element 10 to NUREG-1801, Section XI.S6, this program considers the technical information and industry operating experience provided in NUREG-1522.

The history of 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 Structures Monitoring 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 Structures Monitoring Program has been effective at identifying and managing the aging effects of change in material properties, cracking, loss of sealing, and reduction or loss of isolation function of elastomeric components; loss of material of steel and other metal components; and cracking, increase in porosity and permeability, loss of bond, loss of material, loss of strength, and reduction in concrete anchor capacity of concrete components associated with structures in the scope of the Structures Monitoring Program. The Structures Monitoring Program provides reasonable assurance that the effects of aging are 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 THERMAL AGING EMBRITTLEMENT OF CAST AUSTENITIC STAINLESS STEEL (CASS)

Program Description

The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS) Program is a new program that manages the aging effects of cracking and reduction in fracture toughness in CASS components. The program consists of a determination of the susceptibility of CASS piping, piping components, and piping elements and the pressurizer spray head and regenerative heat exchanger shell 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 volumetric 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 executed and will be factored into the program via the confirmation and corrective action elements of the SQN 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 SQN involving this aging effect. As stated in NUREG-1801 Volume 2, Revision 1, Section XI.M12, this new program was developed using research data (NUREG/CR-4513, Revision 1) 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 during 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 will be effective at identifying and managing the aging effects of cracking and reduction in fracture toughness for CASS components. The Thermal Aging Embrittlement of Cast Austenitic Stainless Steel Program provides reasonable assurance that the effects of aging due to reduction in fracture toughness are 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.1.42 WATER CHEMISTRY CONTROL – CLOSED TREATED WATER SYSTEMS

Program Description

The Water Chemistry Control – Closed Treated Water Systems Program manages loss of material, cracking, and fouling 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 the internal surface condition, to determine the presence of corrosion and/or cracking. The latest revision of the EPRI closed-cycle cooling guidelines and operating experience 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.

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 provide a corrosion inhibitor for the following chilled water subsystems in accordance with industry guidelines and vendor recommendations: • Auxiliary building cooling • Incore Chiller 1A, 1B, 2A, & 2B • 6.9 kV Shutdown Board Room A & B

Element Affected	Enhancement
3. Parameters Monitored or Inspected	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to conduct inspections whenever a boundary is opened for the following systems: • Standby diesel generator jacket water subsystem • Component cooling system • Glycol cooling loop system • High pressure fire protection diesel jacket water system • Chilled water portion of miscellaneous HVAC systems (i.e., auxiliary building, Incore Chiller 1A, 1B, 2A, & 2B, and 6.9 kV Shutdown Board Room A & B)
4. Detection of Aging Effects	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to state these inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection and personnel qualification procedures that are capable of detecting corrosion or cracking.
4. Detection of Aging Effects	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to perform sampling and analysis of the glycol cooling system per industry standards and in no case greater than quarterly unless justified with an additional analysis.

Element Affected	Enhancement
4. Detection of Aging Effects	Revise Water Chemistry Control – Closed Treated Water Systems Program procedures to inspect a representative sample of piping and components at a frequency of once every ten years for the following systems: • Standby diesel generator jacket water subsystem • Component cooling system • Glycol cooling loop system • High pressure fire protection diesel jacket water system • Chilled water portion of miscellaneous HVAC systems (i.e., auxiliary building, Incore Chiller 1A, 1B, 2A, & 2B, and 6.9 kV Shutdown Board Room A & B) Components inspected will be those with the highest likelihood of corrosion or cracking. 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. These inspections will be in accordance with applicable ASME Code requirements, industry standards, or other plant-specific inspection and personnel qualification procedures that ensure the capability of detecting corrosion or cracking.

<u>Operating Experience</u>

In May 2002, the SQN chemistry department performed an assessment to review areas for improvement that had been identified in prior assessments. This included the following for closed cooling water systems.

- Conductivity/corrosion inhibitor ratio was not trended for molybdate-treated and nitrite-treated systems as described in EPRI TR-107396. The SQN response was to implement trending of molybdate and nitrite inhibitor ratio.

- Although strategic plans were found in compliance with NEI 97-06, it was noted that these plans were in need of updates at SQN. The SQN response was to update the Closed Cooling System Chemistry Strategic Plan.

- Area found acceptable: chemistry excursions and adverse trends which had occurred within the past two years were effectively addressed through the CAP. Microbiological control programs had been effective.

A 2009 assessment of the SQN closed cooling water program was performed to identify gaps to excellence in the programmatic area of closed cooling water chemistry. The assessment was based on EPRI Closed Cooling Water Guidelines. The assessment performed data reviews of the CAP, reviewed the control of the chemical control parameters to evaluate any declining trends, reviewed industry operating experience, reviewed the site strategic plan, and reviewed impacts from conversion to the new chemical vendor. The assessment noted that SQN has a philosophy of maintaining all parameters in the center of the target band and has included this in the Strategic Plan. Using a product that is known to drive the pH down in the diesel generator cooling water jackets, the cognizant chemist has developed a method to titrate a sample to determine the exact amount of caustic required to control the pH in the middle of the band. TVA corporate chemistry has documented this strength as a learning opportunity for application at the other sites.

In 2011, the need for repeated requests to drain and refill diesel generator jacket cooling water in order to sustain adequate pH levels was a challenge. The associated procedure has been enhanced to allow the use of sodium hydroxide as a method to control pH levels in accordance with vendor recommendations and EPRI standards.

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 history of 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 – Closed Treated Water Systems 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 – Closed Treated Water Systems Program has been effective at identifying and managing aging effects of loss of material, cracking, and fouling for components in a treated water environment. The Water Chemistry Control – Closed Treated Water Systems Program provides reasonable assurance that the effects of aging are 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.1.43 WATER CHEMISTRY CONTROL – PRIMARY AND SECONDARY

Program Description

The Water Chemistry Control – Primary and Secondary Program manages loss of material, cracking, and fouling in components exposed to a treated water environment 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. 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.1.29) 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

Primary Chemistry

It is generally accepted that zinc is effective at mitigating the extent and consequences of general corrosion of both austenitic stainless steels and nickel-base alloys in primary water. Laboratory tests performed by Westinghouse indicate a beneficial effect of zinc addition on the major materials in a PWR system (e.g., Alloy 600, 304 and 316 stainless steels, and stellite). These tests showed that the corrosion rates of all of the materials are reduced by about a factor of three or more with the addition of 20 ppb of zinc. Furthermore, the addition of zinc to the RCS of PWRs at zinc concentrations up to 40 ppb in middle-duty cores has no apparent effect on the safe and reliable operation of these primary system components. This conclusion is based on in-situ monitoring of reactor coolant pump shaft and frame vibration, end-of-cycle inspections of RCP seal leak-off characteristics, and examination of valve repair records. Based on this industry operating experience, an RCS depleted-zinc treatment program was initiated to reduce plant exposure rates for Unit 1 in May 2002 and for Unit 2 in September 2002. In addition, this treatment improves fuel integrity by reducing cladding temperature and oxidation rate.

Based upon industry operating experience at Ginna, and more recently at Byron, Robinson, and South Texas, SQN now uses macroporous strong base anion resins in CVCS mixed beds and spent fuel pool demineralizer during power operation and outages for improved particulate cleanup. Since macroporous resins were introduced at SQN, the number of filter element replacements for the reactor coolant, seal injection, and spent fuel pool filters has been reduced.

In December 2007, an approach for RCS constant pH increase was approved. The SQN chemistry staff recognized that RCS pH needed to be improved, and in order to optimize control of RCS pH for the major construction materials used in the RCS, elevated constant pH programs were considered. In an attempt to accomplish zero fuel failure, SQN's chemistry program initiated its primary coolant pH increase on an at-temperature pH at 300°C.

Revision 6 of the PWR Primary Water Chemistry Guidelines recommended maintaining silica less than 3000 ppb. Framatome ANP recommends that silica be limited to 1500 ppb. SQN established the silica limit as less than 1000 ppb.

In 2008, industry operating experience documented by EPRI in the latest PWR water chemistry guidelines was used to update the primary chemistry specifications at SQN. In 2009, a new pH data sheet was added to these specifications based on pH curves generated from the latest EPRI Chem Works 4.0 software.

The 2010 revision of the primary chemistry strategic plan established a sound chemistry approach for minimizing primary system corrosion. To achieve this objective, chemistry controls and monitoring requirements representing current industry understanding of an effective primary water chemistry program were implemented. Operating experience documented in NEI-97-06, "Steam Generator Program Guidelines"; NEI 03-08, "Guideline for the Management of Materials Issues"; Steam Generator Management Program (SGMP) Issues Integration Group guidance; and the latest revision of the EPRI PWR Primary Water Chemistry Guidelines was applied.

A 2011 review of SQN lithium control assessed it as extremely effective in maintaining primary lithium control.

<u>Secondary Chemistry</u>

Secondary chemistry has improved since the removal of copper alloy tubing in various plant equipment, including feedwater heater tubing, moisture separator reheater tubing, and condenser tubes. Copper interferes with pH control and increases corrosion products on the secondary side, eventually being deposited in the steam generators.

Condensate polishers were a major source of sodium. A new water treatment plant was installed in 1997. This water treatment plant was further upgraded in 2011. The water treatment plant supplies better quality water than do the condensate polishers, which are no longer used for normal operation.

A 2001 assessment of the chemistry laboratory found that SQN has excellent on-line instrument monitoring capability allowing rapid identification of chemistry perturbations. This same assessment concluded that personnel implementing the program were knowledgeable and capable, striving for excellent performance, with data reviews that were complete, accurate, and timely. An evaluation of the operating experience review process showed that industry events are routinely communicated to chemistry management.

Chemistry personnel identified that the Unit 1 condensate storage tank internal coating was having a negative effect on steam generator sulfates. Based on this operating experience, the Unit 1 condensate storage tank internal coating was replaced in 2003, and the Unit 2 condensate storage tank internal coating was replaced in 2005.

A 2004 evaluation of statistical quality control for bench, on-line, and count room instrumentation identified areas for improvement regarding chemistry software qualification and actions to be taken in response to control limits and warning limits. Corrective actions were developed and implemented.

A 2006 assessment of secondary chemistry control concluded that it was meeting all EPRI recommendations. The corrective actions for the loss of hydrazine feed event were found to have quickly corrected a program deficiency.

A 2007 study of the secondary chemistry strategic plan found it to be well-written and an adequate description of the program. However, this same study identified that condensate polisher performance was marginal. Corrective actions were taken to ensure that secondary chemistry was maintained within program limits.

A 2008 assessment of secondary chemistry iron transport issues showed that present operating practices provided good corrosion control.

A 2010 assessment evaluated specific elements of the SQN secondary chemistry strategic program for compliance with requirements contained in the EPRI Secondary Water Chemistry Guidelines (Rev. 7) and compared the SQN program to similar plans used at Watts Bar, D. C. Cook, and Palo Verde. Areas for improvement were identified and implemented. SQN has taken no exceptions to "mandatory" or "shall" requirements contained within the EPRI Secondary Water Chemistry Guidelines (Rev. 7).

Chemistry personnel noted that contaminants and oxygen were entering the secondary side through equipment seals supplied by the gland seal system. The original equipment seals were replaced with an improved equipment seal design, resulting in fewer contaminants and less oxygen entering the secondary side.

During a Unit 2 forced outage in 2010, sample results indicated elevated steam generator sodium, chloride, and sulfate levels. However, the cause of the high contaminants in the sample was determined to be inadequate nitrogen sparging prior to sampling at the drain valve coming off the side of the steam generator near the tube sheet. Training was performed with lab personnel to identify that mixing the steam generator using the wet layup system and collecting samples off the wet layup pump discharge sample valves provides more representative samples of the steam generator water.

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 84-18, 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 history of 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 has been effective at identifying and managing aging effects of loss of material, cracking, and fouling for components in a treated water environment. The Water Chemistry Control – Primary and Secondary Program provides reasonable assurance that the effects of aging are 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 Applicant Action Items for Inspection and Evaluation Guidelines for PWR Internals

Sequoyah Nuclear Plant

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.

The NRC safety evaluation for MRP-227 is included in MRP-227-A, in which the NRC staff determined that MRP-227 is acceptable for referencing in license renewal applications for PWR internals inspection and evaluation. The safety evaluation includes eight plant-specific applicant action items. Included in these items is a request to provide a plant-specific reactor vessel internals inspection plan.

These eight plant-specific applicant action items and the plant-specific reactor vessel internals inspection plan are addressed in the following tables.

Applicant Action Item Description	Response
(1) Each applicant/licensee is responsible for assessing its plant's design and operating history and demonstrating that the approved version of MRP-227 is applicable to the facility. Each applicant/licensee shall refer, in particular, to the assumptions regarding plant design and operating history made in the FMECA and functionality analyses for reactors of their design (i.e., Westinghouse, CE, or B&W) which support MRP-227 and describe the process used for determining plant-specific differences in the design of their RVI components or plant operating conditions, which result in different component inspection categories. The applicant/licensee shall submit this evaluation for NRC review and approval as part of its application to implement the approved version of MRP-227.	SQN has assessed its plant design and operating history and has determined that MRP-227-A is applicable to the facility. The assumptions regarding plant design and operating history made in MRP-191 are appropriate for SQN and there are no differences in component inspection categories at SQN. The failure modes, effects, and criticality analyses (FMECA) and functionality analyses were based on the assumption of 30 years of operation with high leakage core loading patterns followed by implementation of a low leakage fuel management strategy for the remaining 30 years of operation. SQN Units 1 and 2 changed from a high to low leakage core load pattern prior to the 30 years of operation. SQN is bounded by the assumptions in MRP-191. SQN has always operated as a base-load plant which operates at fixed power levels and does not vary power on a calendar or load demand schedule. In addition, SQN has not made any modifications to the internals beyond those identified in general industry guidance or recommended by the original vendor since May 2007. Therefore, there are no differences in component inspection categories.

Applicant Action Item Description	Response
(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 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 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.	MRP-189 and Table 4-5 of MRP-191 are not applicable to SQN. SQN reviewed the information in Table 4-4 of MRP-191 and determined that there are no additional components contained in the SQN design. Table 4-4 of MRP-191 contains all of the RVI components that are within the scope of license renewal for SQN Units 1 and 2.
(3) Applicants/licensees of CE and Westinghouse are required to perform plant-specific analysis either to justify the acceptability of an applicant's/licensee's existing programs, or to identify changes to the programs that should be implemented to manage the aging of these components for the period of extended operation. The results of this plant-specific analyses and a description of the plant-specific programs being relied on to manage aging of these components shall be submitted as part of the applicant's/licensee's AMP application. The CE and Westinghouse components identified for this type of plant-specific evaluation include: CE thermal shield positioning pins and CE in-core instrumentation thimble tubes (Section 4.3.2 in MRP-227), and Westinghouse guide tube support pins (split pins) (Section 4.3.3 in MRP-227).	SQN installed the third generation of split pins in the fall of 2001 for Unit 1 and spring of 2002 for Unit 2. The new split pins were qualified for 40 years from the time of installation. Potential aging effects were evaluated, including those identified in MRP-191 Table 5-1. No additional inspection requirements were established for the control rod guide tube support pins in the design change packages that installed them based on the following: • Cold-worked Type 316 SS split pins have been installed at other plants since 1997 and none of these plants have experienced any failures. • Since other plants have installed split pins since 1997 and SQN did not install them until 2001 for Unit 1 and 2002 for Unit 2, the other plants will provide a leading indicator. At SQN the effects of aging on these components will be managed in the period of extended operation based on operating experience.

Applicant Action Item Description	Response
(4) B&W applicants/licensees shall confirm that the core support structure upper flange weld was stress relieved during the original fabrication of the [reactor pressure vessel] RPV in order to confirm the applicability of MRP-227, as approved by the NRC, to their facility. If the upper flange weld has not been stress relieved, then this component shall be inspected as a "Primary" inspection category component. If necessary, the examination methods and frequency for non-stress relieved B&W core support structure upper flange welds shall be consistent with the recommendations in MRP-227, as approved by the NRC, for the Westinghouse and CE upper core support barrel welds. The examination coverage for this B&W flange weld shall conform to the staff's imposed criteria as described in Sections 3.3.1 and 4.3.1 of this SE. The applicant's/licensee's resolution of this plant-specific action item shall be submitted to the NRC for review and approval.	This action item does not apply to Westinghouse designed units.
(5) 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. Based on results of the plant specific evaluation discussed in Section 3.3.5, B&W baffle-to-baffle bolts and core barrel-to-former bolts may also require physical examination. 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 as part of their submittal to apply the approved version of MRP-227.	The SQN plant specific acceptance criteria for hold-down springs and an explanation of how the proposed acceptance criteria are consistent with the SQN licensing basis and the need to maintain the functionality of the hold-down springs under all licensing basis conditions will be developed prior to the first required physical measurement.

Applicant Action Item Description	Response
(6) MRP-227 does not propose to inspect the following inaccessible components: the B&W core barrel cylinders (including vertical and circumferential seam welds), B&W former plates, B&W external baffle-to-baffle bolts and their locking devices, B&W core barrel-to-former bolts and their locking devices, and B&W core barrel assembly internal baffle-to-baffle bolts. MRP also identified that although the B&W core barrel assembly internal baffle-to baffle bolts are accessible, the bolts are non-inspectable using currently available examination techniques. Applicants/licensees will justify the acceptability of these components for continued operation through the period of extended operation by performing an evaluation, or by proposing a scheduled replacement of the components. As part of their application to implement MRP-227, applicants/licensees shall provide their justification for the continued operability of each of the inaccessible components and, if necessary, provide their plan for the replacement of the components for NRC review and approval.	This action item does not apply to Westinghouse designed units.

Applicant Action Item Description	Response
(7) The applicants/licensees of B&W, CE, and Westinghouse reactors are required to develop plant-specific analyses to be applied for their facilities to demonstrate that B&W [in-core monitoring instrumentation] IMI guide tube assembly spiders and CRGT spacer castings, CE lower support columns, and Westinghouse lower support column bodies will maintain their functionality during the period of extended operation, or for additional RVI components that may be fabricated from CASS, martensitic stainless steel, or precipitation hardened stainless steel materials. These analyses should also consider the possible loss of fracture toughness in these components due to thermal and irradiation embrittlement, and may also need to consider limitations on accessibility for inspection and the resolution/sensitivity of the inspection techniques. The requirements may not apply to components that were previously evaluated as not requiring aging management during the development of MRP-227. That is the requirement would apply to components fabricated from susceptible materials for which an individual licensee has determined aging management is required, for example during their review performed in accordance with Applicant/License Action Item 2. The plant-specific analysis shall be consistent with the plant's licensing basis and the need to maintain the functionality of the components being evaluated under all licensing basis conditions of operation. The applicants/licensees shall include the plant-specific analysis as part of their submittal to apply the approved version of MRP-227.	The lower support column bodies at SQN are fabricated from forged Type 304 and 304a stainless steel. Therefore, no site-specific analysis is necessary for the lower support column bodies. The lower core support plate is fabricated from CASS. However, based on the certified material test report and the determination of susceptibility to reduction in fracture toughness due to thermal embrittlement described in NUREG-CR-4513, the lower core support plate is not subject to reduction in fracture toughness. In addition, according to MRP-191, the lower core support plate is not subject to reduction in fracture toughness due to irradiation embrittlement. Therefore the lower core support plate will maintain its functionality under all licensing basis conditions of operation.

Applicant Action Item Description	Response
(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.	The AMP that addresses the ten program elements as defined in NUREG-1801, Revision 2, AMP XI.M16A, is submitted as LRA Appendix B Section B.1.34.

Applicant Action Item Description	Response
(8) continued 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.	The RVI inspection plan with the plant-specific action items for the primary components, expansion components, existing program components, and examination acceptance and expansion criteria tables is provided in Tables C-1 through C-4.
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.	The UFSAR Supplement is included in LRA Appendix A Section A.1.34 and includes a summary of the programs and activities specified as necessary for the Reactor Vessel Internals Program.

Applicant Action Item Description	Response
(8) continued 4. The regulation at 10 CFR 54.22 requires each applicant for LR to submit any [Technical Specification] 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 CLBs that include mandated inspection or analysis requirements for [reactor vessel] RV internals either in the operating license for the facility or in the facility 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.	No technical specification changes have been identified for SQN based upon MRP-227-A and its safety evaluation.

Applicant Action Item Description	Response
(8) continued	
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.	TLAAs are identified in LRA Section 4.

Table C-1
Primary Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Expansion Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Control rod guide tube (CRGT) assembly • Guide plates (cards)	SQN Units 1 and 2	Loss of material (wear)	None	Visual (VT-3) examination no later than two refueling outages after the license renewal period begins and no earlier than two refueling outages prior to the start of the license renewal period. Subsequent examinations are required on a ten-year interval.	20% examination of the number of CRGT assemblies, with all guide cards within each selected CRGT assembly examined.
CRGT assembly • Lower flange welds	SQN Units 1 and 2	Cracking (SCC, fatigue) Aging management (Irradiation embrittlement [IE] and thermal embrittlement [TE])	Bottom-mounted instrumentation (BMI) column bodies Upper core plate Lower support casting	Enhanced visual (EVT-1) examination to determine the presence of crack-like surface flaws in flange welds no later than two refueling outages from the beginning of the license renewal period and subsequent examination on a ten-year interval.	100% of outer (accessible) CRGT lower flange weld surfaces and adjacent base metal on the individual periphery CRGT assemblies. (Note 2)

Table C-1 (Continued)
Primary Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Expansion Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Core barrel assembly • Upper core barrel flange weld	SQN Units 1 and 2	Cracking (SCC)	Lower support column bodies Core barrel outlet nozzle welds	Periodic enhanced visual (EVT-1) examination no later than two refueling outages from the beginning of the license renewal period and subsequent examination on a ten-year interval.	100% of one side of the accessible surfaces of the selected weld and adjacent base metal. (Note 4)
Core barrel assembly • Upper and lower core barrel cylinder girth welds	SQN Units 1 and 2	Cracking (SCC, irradiation-assisted stress corrosion cracking [IASCC], fatigue)	Upper and lower core barrel cylinder axial welds	Periodic enhanced visual (EVT-1) examination no later than two refueling outages from the beginning of the license renewal period and subsequent examination on a ten-year interval.	100% of one side of the accessible surfaces of the selected weld and adjacent base metal. (Note 4)
Core barrel assembly • Lower core barrel flange weld. (Note 5)	SQN Units 1 and 2	Cracking (SCC, fatigue)	None	Periodic enhanced visual (EVT-1) examination, no later than two refueling outages from the beginning of the license renewal period and subsequent examination on a ten-year interval.	100% of one side of the accessible surfaces of the selected weld and adjacent base metal. (Note 4)

Table C-1 (Continued)
Primary Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Expansion Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Baffle-former assembly • Baffle-edge bolts	SQN Units 1 and 2	Cracking (IASCC, fatigue) that results in • Lost or broken locking devices • Failed or missing bolts • Protrusion of bolt heads Aging management (IE and irradiation-enhanced stress relaxation [ISR]) (Note 6)	None	Visual (VT-3) examination, with baseline examination between 20 and 40 EFPY and subsequent examinations on a ten-year interval.	Bolts and locking devices on high fluence seams. 100% of components accessible from core side. (Note 3)
Baffle-former assembly • Baffle-former bolts	SQN Units 1 and 2	Cracking (IASCC, fatigue) Aging management (IE and ISR) (Note 6)	Lower support column bolts Barrel-former bolts	Baseline volumetric (UT) examination between 25 and 35 EFPY, with subsequent examination on a ten-year interval.	100% of accessible bolts. (Note 3) Heads accessible from the core side. UT accessibility may be affected by complexity of head and locking device designs.

Table C-1 (Continued)
Primary Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Expansion Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Baffle-former assembly • Assembly (includes baffle plates, baffle edge bolts, and indirect effects of void swelling in former plates)	SQN Units 1 and 2	Distortion (void swelling), or cracking (IASCC) that results in • Abnormal interaction with fuel assemblies • Gaps along high fluence baffle joint • Vertical displacement of baffle plates near high fluence joint • Broken or damaged edge bolt locking systems along high fluence baffle joint	None	Visual (VT-3) examination to check for evidence of distortion, with baseline examination between 20 and 40 EFPY and subsequent examinations on a ten-year interval.	Core side surface as indicated.

Table C-1 (Continued)
Primary Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Expansion Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Alignment and interfacing components • Internals hold down spring	SQN Unit 1	Distortion (loss of load) (Note 7)	None	Direct measurement of spring height within three cycles of the beginning of the license renewal period. If the first set of measurements is not sufficient to determine life, spring height measurements must be taken during the next two outages, in order to extrapolate the expected spring height to 60 years.	Measurements should be taken at several points around the circumference of the spring, with a statistically adequate number of measurements at each point to minimize uncertainty.
Thermal shield assembly • Thermal shield flexures	SQN Units 1 and 2	Cracking (fatigue) or loss of materials (wear) that results in thermal shield flexures excessive wear, fracture or complete separation	None	Visual (VT-3) no later than two refueling outages from the beginning of the license renewal period. Subsequent examinations on a ten year interval.	100% of thermal shield flexures

1. Examination acceptance criteria and expansion criteria for the Westinghouse components are in Table C-4.
2. A minimum of 75% of the total identified sample population must be examined.
3. A minimum of 75% of the total population (examined and unexamined) including coverage consistent with the expansion criteria in Table C-4 must be examined.
4. A minimum of 75% of the total weld length (examined and unexamined) including coverage consistent with the expansion criteria in Table C-4, must be examined from either the inner or outer diameter for inspection credit.

5. The lower core barrel flange weld is designated as the core barrel-to-lower support casting.
6. Void swelling effects on this component are managed through management of void swelling on the entire baffle-former assembly.
7. This mechanism was not strictly identified in the original list of age-related degradation mechanisms.

Table C-2
Expansion Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Primary Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Upper internals assembly • Upper core plate	SQN Units 1 and 2	Cracking (fatigue, wear)	CRGT lower flange weld	Enhanced visual (EVT-1) examination. Re-inspection every 10 years following initial inspection.	100% of accessible surfaces. (Note 2)
Lower internals assembly • Lower support casting	SQN Units 1 and 2	Cracking Aging management (TE in casting)	CRGT lower flange weld	Enhanced visual (EVT-1) examination. Re-inspection every 10 years following initial inspection.	100% of accessible surfaces. (Note 2)
Core barrel assembly • Barrel-former bolts	SQN Units 1 and 2	Cracking (IASCC, fatigue) Aging management (IE, void swelling and ISR)	Baffle-former bolts	Volumetric (UT) examination. Re-inspection every 10 years following initial inspection.	100% of accessible bolts. Accessibility may be limited by presence of thermal shield. (Note 2)
Lower support assembly • Lower support column bolts	SQN Units 1 and 2	Cracking (IASCC, fatigue) Aging management (IE, and ISR)	Baffle-former bolts	Volumetric (UT) examination. Re-inspection every 10 years following initial inspection.	100% of accessible bolts or as supported by plant-specific justification. (Note 2)

Table C-2 (Continued)
Expansion Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Primary Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
Core barrel assembly • Core barrel outlet nozzle welds	SQN Units 1 and 2	Cracking (SCC, fatigue) Aging management (IE, of lower sections)	Upper core barrel flange weld	Enhanced visual (EVT-1) examination. Re-inspection every 10 years following initial inspection.	100% of one side of the accessible surfaces of the selected weld and adjacent base metal. (Note 2)
Core barrel assembly • Upper and lower core barrel cylinder axial welds	SQN Units 1 and 2	Cracking (SCC, IASCC) Aging management (IE)	Upper and lower core barrel cylinder girth welds	Enhanced visual (EVT-1) examination. Re-inspection every 10 years following initial inspection.	100% of one side of the accessible surfaces of the selected weld and adjacent base metal. (Note 2)
Lower support assembly • Lower support column bodies (not cast)	SQN Units 1 and 2	Cracking (IASCC) Aging management (IE)	Upper core barrel flange weld	Enhanced visual (EVT-1) examination. Re-inspection every 10 years following initial inspection.	100% of accessible surfaces. (Note 2)

Table C-2 (Continued)
Expansion Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Primary Link (Note 1)	Examination Method/ Frequency (Note 1)	Examination Coverage
BMI system • BMI column bodies	SQN Units 1 and 2	Cracking (fatigue) including the detection of completely fractured column bodies Aging management (IE)	Control rod guide tube (CRGT) lower flanges	Visual (VT-3) examination of BMI column bodies as indicated by difficulty of insertion/withdrawal of flux thimbles. Re-inspection every 10 years following initial inspection. Flux thimble insertion/ withdrawal to be monitored at each inspection interval.	100% of BMI column bodies for which difficulty is detected during flux thimble insertion/ withdrawal.

1. Examination acceptance criteria and expansion criteria for the Westinghouse components are in Table C-4.
2. A minimum of 75% coverage of the entire examination area or volume or a minimum sample size of 75% of the population of like components of the examination is required (including both the accessible and in accessible portions).

Table C-3
Existing Program Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Reference	Examination Method	Examination Coverage
Core barrel assembly • Core barrel flange	SQN Units 1 and 2	Loss of material (wear)	ASME Code Section XI	Visual (VT-3) examination to determine general condition for excessive wear.	All accessible surfaces at specified frequency.
Upper internals assembly • Upper support ring or skirt	SQN Units 1 and 2	Cracking (SCC, fatigue)	ASME Code Section XI	Visual (VT-3) examination	All accessible surfaces at specified frequency.
Lower internals assembly • Lower core plate	SQN Units 1 and 2	Cracking (IASCC, fatigue) Aging management (IE)	ASME Code Section XI	Visual (VT-3) examination of the lower core plates to detect evidence of distortion and/or loss of bolt integrity.	All accessible surfaces at specified frequency.
Lower internals assembly • Lower core plate	SQN Units 1 and 2	Loss of material (wear)	ASME Code Section XI	Visual (VT-3) examination.	All accessible surfaces at specified frequency.
BMI system • Flux thimble tubes	SQN Units 1 and 2	Loss of material (wear)	NUREG-1801 Rev. 2 NRC Bulletin 88-09	Surface (ET) examination.	Eddy current surface examination as defined in plant response to NRC Bulletin 88-09.

Table C-3 (Continued)
Existing Program Components at SQN Units 1 and 2

Item	Applicability	Effect (Mechanism)	Reference	Examination Method	Examination Coverage
Alignment and interfacing components Clevis insert bolts	SQN Units 1 and 2	Loss of material (wear) Note 1	ASME Code Section XI	Visual (VT-3) examination.	All accessible surfaces at specified frequency.
Alignment and interfacing components Upper core plate alignment pins	SQN Units 1 and 2	Loss of material (wear)	ASME Code Section XI	Visual (VT-3) examination.	All accessible surfaces at specified frequency.

1. Bolt was screened in because of stress relaxation and associated cracking; however, wear of the clevis insert is the issue.

Table C-4
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
CRGT assembly • Guide plates (cards)	SQN Units 1 and 2	Visual (VT-3) examination. The specific relevant condition is wear that could lead to loss of control rod alignment and impede control assembly insertion. The unworn section of guide card slot must be observable at all inner guide tube holes at each guide card level. (Refer to WCAP-17096-NP, Attachment E)	None	N/A	N/A

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
CRGT assembly • Lower flange welds	SQN Units 1 and 2	Enhanced visual (EVT-1) examination. The specific relevant condition for the lower CRGT flange weld is a detectable crack-like surface indication. (Refer to WCAP-17096-NP Attachment E)	a. BMI column bodies b. Upper core plate and lower support casting	a. Confirmation of surface-breaking indications in two or more CRGT lower flange welds, combined with flux thimble insertion/withdrawal difficulty, shall require visual (VT-3) examination of BMI column bodies by the completion of the next refueling outage. b. Confirmation of surface-breaking indications in two or more CRGT lower flange welds shall require EVT-1 examination of upper core plate and lower support casting within three fuel cycles following the initial observation.	a. For BMI column bodies, the specific relevant condition for the VT-3 examination is completely fractured column bodies. The number of required BMI column bodies failed must be less than that required to perform flux mapping. (Refer to WCAP-17096-NP Attachment E.) b. For upper core plate and lower support casting, the specific relevant condition is a detectable crack-like surface indication.

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Core barrel assembly • Upper core barrel flange weld	SQN Units 1 and 2	Periodic enhanced visual (EVT-1) examination. The specific relevant condition is a detectable crack-like surface indication.	a. Core barrel outlet nozzle welds b. Lower support column bodies (not cast)	a. The confirmed detection and sizing of a surface-breaking indication with a length greater than two inches in the upper core barrel flange weld shall require that the EVT-1 examination be expanded to include the core barrel outlet nozzle welds by the completion of the next refueling outage. b. If extensive cracking in the core barrel outlet nozzle welds is detected, EVT-1 examination shall be expanded to include the upper six inches of the accessible surfaces of the non cast lower support column bodies within three fuel cycles following initial observation.	a. The specific relevant condition for the expansion core barrel outlet nozzle weld examination is a detectable crack-like surface indication. b. The specific relevant condition for the expansion lower column body's examination is a detectable crack-like surface indication. The number of required lower column bodies failed must be less than half of the total number of column bodies minus the number required divided by 2 to ensure the support function is maintained. (continued below)

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Core barrel assembly • Upper core barrel flange weld (continued)					N = the number of support columns N_f = the number of failed columns N_{req} = the number of support columns required $N_f < (N-N_{req})/2$ (Refer to WCAP-17096-NP Attachment E.)
Core barrel assembly • Lower core barrel flange weld	SQN Units 1 and 2	Enhanced visual (EVT-1) examination. The specific relevant condition is a detectable crack-like surface indication.	None	None	None

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Core barrel assembly • Upper core barrel cylinder girth welds	SQN Units 1 and 2	Periodic enhanced visual (EVT-1) examination. The specific relevant condition is a detectable crack-like surface indication.	Upper core barrel cylinder axial welds	The confirmed detection and sizing of a surface-breaking indication with a length greater than two inches in the upper core barrel cylinder girth welds shall require that the EVT-1 examination be expanded to include the upper core barrel cylinder axial welds by the completion of the next refueling outage.	The specific relevant condition for the expansion upper core barrel cylinder axial weld examination is a detectable crack-like surface indication.
Core barrel assembly • Lower core barrel cylinder girth welds	SQN Units 1 and 2	Periodic enhanced visual (EVT-1) examination. The specific relevant condition is a detectable crack-like surface indication.	Lower core barrel cylinder axial welds	The confirmed detection and sizing of a surface-breaking indication with a length greater than two inches in the lower core barrel cylinder girth welds shall require that the EVT-1 examination be expanded to include the lower core barrel cylinder axial welds by the completion of the next refueling outage.	The specific relevant condition for the expansion lower core barrel cylinder axial weld examination is a detectable crack-like surface indication.

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Baffle-former assembly • Baffle-edge bolts	SQN Units 1 and 2	Visual (VT-3) examination. The specific relevant conditions are missing or broken or missing locking devices, failed or missing bolts or bolt heads, and protrusion of bolt heads. According to WCAP-17096-NP the baffle edge bolts are not required to maintain the structural integrity of the baffle. However, if the baffle seems open due to bolt failure, baffle jetting may occur on the peripheral fuel assemblies. In addition, broken or missing locking devices and failed or missing bolts or bolt heads can result in loose parts and interference with the fuel. The acceptance criterion needs to be established by a failure mode effects analysis. (Refer to WCAP-17096-NP Attachment E)	None	N/A	N/A

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Baffle-former assembly • Baffle-former bolts	SQN Units 1 and 2	Volumetric (UT) examination. The examination acceptance criteria for the UT of the baffle-former bolts shall be established as part of the examination technical justification.	a. Lower support column bolts b. Barrel-former bolts	a. Confirmation that more than 5% of the baffle-former bolts actually examined on the four baffle plates at the largest distance from the core (presumed to be the lowest dose locations) contain unacceptable indications shall require UT examination of the lower support column bolts within the next three fuel cycles. b. Confirmation that more than 5% of the lower support column bolts actually examined contain unacceptable indications shall require UT examination of the barrel-former bolts.	a and b. The examination acceptance criteria for the UT of the lower support column bolts and the barrel-former bolts shall be established as part of the examination technical justification.

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Baffle-former assembly • Assembly	SQN Units 1 and 2	Visual (VT-3) examination. The specific relevant conditions are evidence of abnormal interaction with fuel assemblies, gaps along high fluence shroud plate joints, vertical displacement of shroud plates near high fluence joints, and broken or damaged edge bolt locking systems along high fluence baffle plate joints.	None	N/A	N/A

Table C-4 (Continued)
Examination Acceptance and Expansion Criteria at SQN Units 1 and 2

Item	Applicability	Examination Acceptance Criteria (Note 1)	Expansion Link(s)	Expansion Criteria	Additional Examination Acceptance Criteria
Alignment and interfacing components • Internals hold-down spring	SQN Unit 1	Direct physical measurement of spring height. The examination acceptance criterion for this measurement is that the remaining compressible height of the spring shall provide hold-down forces within the plant-specific design tolerance.	None	N/A	N/A
Thermal shield assembly • Thermal shield flexures	SQN Units 1 and 2	Visual (VT-3) examination. The specific relevant conditions for thermal shield flexures are excessive wear, fracture, or complete separation.	None	N/A	N/A

1. The examination acceptance criterion for visual examination is the absence of the specified relevant condition.

Appendix D

Sequoyah Nuclear Plant
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 Sequoyah Nuclear Plant Technical Specifications determined that no changes to the Technical Specifications are required.