Grand Gulf Nuclear Station

License Renewal Application

PREFACE

The following describes the information location, layout, and editorial conventions in the Grand Gulf Nuclear Station (GGNS) 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 version of the GGNS Updated Final Safety Analysis Report in effect on March 1, 2011. The effective date of that version is April 5, 2010. Where revised information in subsequent UFSAR amendments materially affects the LRA, the LRA will be amended in the annual update in accordance with 10 CFR 54.21(b).

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 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 instrumentation and controls. 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 license, 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 (CLB) 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 is the site response to Boiling Water Reactor Vessel and Internals Program (BWRVIP) Applicant Action Items. License renewal application action items identified in the corresponding Nuclear Regulatory Commission (NRC) safety evaluation (SE) for each of the reports listed are addressed in this appendix.

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

Appendix E 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	Description
ABV	auxiliary building ventilation
AC	alternating current
ACI	American Concrete Institute
ACSR	aluminum conductor steel reinforced
ADAMS	[NRC] Agencywide Documents Access and Management System
ADHRS	alternate decay heat removal subsystem
ADS	automatic depressurization system
AEM	aging effect/mechanism
Al	aluminum
AMP	aging management program
AMR	aging management review
ANSI	American National Standards Institute
APRM	average power range monitor
ARI	alternate rod insertion
ART	adjusted reference temperature
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
ATWS	anticipated transient without scram
BADGER	Boron-10 Areal Density Gage for Evaluating Racks
BTP	Branch Technical Position
BOP	balance of plant
BWR	boiling water reactor
BWRVIP	Boiling Water Reactor Vessel and Internals Program
CAP	Corrective Action Program
CASS	cast austenitic stainless steel

Abbreviation or Acronym	**Description**
CBHVAC	control building heating ventilating and air conditioning
CCW	component cooling water
CDIC	containment and drywell instrumentation and control
CE	conducts electricity
CF	chemistry factor
CFR	Code of Federal Regulations
CGCS	combustible gas control system
CII	containment inservice inspection
CLB	current licensing basis
CLRT	containment leak rate test
CO_2	carbon dioxide
CRD	control rod drive
CRGT	control rod guide tube
CRHVAC	control room heating, ventilation and air conditioning
CRVICS	containment and reactor vessel isolation control system
CRWST	condensate and refueling water storage and transfer
CS	carbon steel
CSA	criticality safety analysis
CST	condensate storage tank
Cu	copper
CUF	cumulative usage factor
DBA	design basis accident
DCW	drywell chilled water
DELS	diesel engine lube [oil] system
ΔP	differential pressure
DGBV	diesel generator building ventilation
DGCAIES	diesel generator combustion air intake and exhaust system
DGCWS	diesel generator cooling water system

Abbreviation or Acronym	**Description**
DGSS	diesel generator [air] starting system
DSP&UCP	drywell, suppression pool, and upper containment pool
ECCS	emergency core cooling system
EFPY	effective full power years
EHC	electrohydraulic control
EIC	electrical and instrumentation and control
EN	shelter or protection
EOF	Emergency Operations Facility
EOI	Entergy Operations, Inc.
EPRI	Electric Power Research Institute
EPU	extended power uprate
EPRV	emergency pump room ventilation
EQ	environmental qualification
ESBRV	emergency switchgear and battery rooms ventilation
ESF	engineered safety feature
ESFESRC	ESF electrical switchgear rooms cooling
ext	external
FAC	flow-accelerated corrosion
FB	fire barrier
FC	flow control
FD	flow distribution
FED	floor and equipment drainage
F_{en}	fatigue correction factor(s)
FERC	Federal Energy Regulatory Commission
FHAR	Fire Hazards Analysis Report
FHAV	fuel handling area ventilation
FLB	flood barrier

Abbreviation or Acronym	**Description**
FPCC	fuel pool cooling and cleanup
FSAR	Final Safety Analysis Report (historical document)
ft-lb	foot-pound
FW	feedwater
FW-LCS	feedwater leakage control system
FWPV	fire water pumphouse ventilation
GE	General Electric
GGN2	Grand Gulf Nuclear Station Unit 2 (incomplete and abandoned)
GGNS	Grand Gulf Nuclear Station
GL	Generic Letter
GSI	Generic Safety Issue
H_2	hydrogen
HCU	hydraulic control unit
HDPE	high density polyethylene
HELB	high-energy line break
HEPA	high-efficiency particulate air
HP	high pressure
HPCS	high pressure core spray
HPCSDG	HPCS diesel generator
HS	heat sink
HVAC	heating, ventilation, and air conditioning
HWC	hydrogen water chemistry
HWC-M	moderate hydrogen water chemistry
IA	instrument air
IASCC	irradiation-assisted stress corrosion cracking
ID	inside diameter; identification

Abbreviation or Acronym	Description
IN	insulation (electrical); [NRC] Information Notice
INS	insulation
int	internal
IPA	integrated plant assessment
IRM	intermediate range monitor
ISG	Interim Staff Guidance
ISI	inservice inspection
ISP	Integrated Surveillance Program
ksi	kilo-pounds per square inch
KV or kV	kilo-volt
LA	Louisiana
LAR	license amendment request
LAS	low alloy steel
LOCA	loss of coolant accident
LP	low pressure
LPCI	low pressure coolant injection
LPCS	low pressure core spray
LPRM	local power range monitors
LR	license renewal
LRA	license renewal application
MB	missile barrier
MCM	thousand circular mils
MoS_2	molybdenum disulfide
MRS	main and reheat steam
MS	Mississippi
MSIV	main steam isolation valve

Abbreviation or Acronym	Description
MSIV-LCS	main steam isolation valve leakage control system
MSR	moisture separator-reheater
MUWT	makeup water treatment
MWt	megawatts-thermal
NA	not applicable
NB	nuclear boiler
NBA	nickel-based alloy
n/cm^2	neutrons per square centimeter
NDE	nondestructive examinations
NEI	Nuclear Energy Institute
NESC	National Electrical Safety Code
NFPA	National Fire Protection Association
Ni	nickel
NPS	nominal pipe size
NRC	Nuclear Regulatory Commission
NSSS	nuclear steam supply system
OE	operating experience
OEP	Operating Experience Program
OVHLL	Overhead Heavy Load and Light Load
PB	pressure boundary
PCA	plant compressed air
PCW	plant chilled water
pH	potential of hydrogen
PM	preventive maintenance
ppb	parts per billion
ppm	parts per million
PRM	process radiation monitoring

Abbreviation or Acronym	Description
PSW	plant service water
P-T	pressure-temperature
PVC	polyvinyl chloride
PWR	pressurized water reactor
QA	quality assurance
QCTP	quencher confirmatory test program
RCIC	reactor core isolation cooling
RCPB	reactor coolant pressure boundary
RCS	reactor coolant system
RFP	reactor feed pump
RFPT	reactor feed pump turbine
RG	Regulatory Guide
RHR	residual heat removal
rpm	revolutions per minute
RPS	reactor protection system
RPV	reactor pressure vessel (synonymous with reactor vessel)
RR	reactor recirculation
RT_{NDT}	reference temperature (nil-ductility transition)
RWCU	reactor water cleanup
RWST	refueling water storage tank
SA	service air
SAMA	severe accident mitigation alternatives
S&PC	steam and power conversion
SBO	station blackout
SC	structure or component
SCBA	self-contained breathing apparatus

Abbreviation or Acronym	**Description**
SCC	stress corrosion cracking
sccm	standard cubic centimeters per minute
SDG	standby diesel generator
SE, SER	Safety Evaluation, Safety Evaluation Report
SERI	System Energy Resources, Inc.
SGTS	standby gas treatment system
SLC	standby liquid control
SMEPA	South Mississippi Electric Power Association
SNS	support for Criterion (a)(2) equipment
SPCU	suppression pool cleanup
SPMU	suppression pool make-up
SRE	support for Criterion (a)(3) equipment
SRM	source range monitor
SRP	[NUREG-1800, License Renewal] Standard Review Plan
SRV	safety relief valve
SS	stainless steel
SSC	system, structure, or component
SSR	support for Criterion (a)(1) equipment
SSW	standby service water
SSWPV	standby service water pumphouse ventilation
STAMR	subject to aging management review
TBCW	turbine building cooling water
TBV	turbine building ventilation
TIP	traversing incore probe
TLAA	time-limited aging analysis (analyses)
UHS	ultimate heat sink
UFSAR	Updated Final Safety Analysis Report

Abbreviation or Acronym	**Description**
USE	upper-shelf energy
V	volt
yr	year
Zn	zinc
¼T	one-fourth of the way through the vessel wall measured from the internal surface of the vessel

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

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 license for Grand Gulf Nuclear Station (GGNS). The facility operating license (NPF-29) expires at midnight, November 1, 2024. The application applies to renewal of the source, special nuclear, and by-product materials licenses that are combined in the facility operating license.

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

The license renewal application is intended to provide sufficient information for the NRC to complete its technical and environmental reviews pursuant to 10 CFR Parts 54 and 51, respectively. The license renewal application is designed to allow the NRC to make the findings required by 10 CFR 54.29 in support of the issuance of a renewed facility operating license for GGNS.

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

Entergy Operations, Inc. (EOI)

System Energy Resources, Inc. (SERI)

South Mississippi Electric Power Association (SMEPA)

1.1.2 Address of Applicant

Entergy Operations Inc.
1340 Echelon Parkway
Jackson, Mississippi 39213

System Energy Resources, Inc.
1340 Echelon Parkway
Jackson, Mississippi 39213

South Mississippi Electric Power Association
7037 US Highway 49
Hattiesburg, Mississippi 39402

Address of Nuclear Facility

Grand Gulf Nuclear Station
7003 Bald Hill Road
P.O. Box 756
Port Gibson, Mississippi 39150

1.1.3 Description of Business of Applicants

Entergy Operations, Inc. (EOI), a subsidiary of Entergy Corporation, is engaged principally in the business of operating nuclear power facilities.

System Energy Resources, Inc., (SERI) is a subsidiary of Entergy Corporation. SERI and South Mississippi Electric Power Association (SMEPA) are principally engaged in the business of owning all or part of a nuclear power facility and the sale of electric energy at wholesale in the United States.

SERI and SMEPA are the owners of GGNS, located in Claiborne County, Mississippi. EOI is the licensed operator of GGNS. SERI, EOI, and SMEPA (hereafter referred to as Entergy) are the holders of GGNS operating license NPF-29 and for purposes of this application are considered the applicant.

1.1.4 Legal Status and Organization

EOI, a Delaware limited liability company, is a wholly owned subsidiary of Entergy Corporation. The principal office is located in Jackson, Mississippi.

SERI, an Arkansas corporation, is a wholly owned subsidiary of Entergy Corporation. The principal place of business is located in Jackson, Mississippi.

SMEPA, a Mississippi corporation, is a cooperative consisting of 11 member-owner electric power associations. SMEPA and its members are consumer-owned, not-for-profit businesses. The principle office for SMEPA is located in Hattiesburg, Mississippi.

EOI, SERI and SMEPA are not owned, controlled, or dominated by any alien, a foreign corporation, or foreign government. EOI, SERI and SMEPA make this application on their own behalf and are not acting as an agent or representative of any other person.

The names and addresses of the board of directors of Entergy Corporation are as follows. Members of the board are all US citizens.

J. Wayne Leonard Chairman	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Maureen S. Bateman Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Gary W. Edwards Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Alexis M. Herman Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Donald C. Hintz Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Stuart L. Levenick Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Blanche Lambert Lincoln Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Stewart C. Meyers Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
William A. Percy II Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
W. J. "Billy" Tauzin Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Steven V. Wilkinson Director	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113

The names and addresses of the principal officers of Entergy Corporation are as follows. The principal officers are all US citizens.

J. Wayne Leonard Chief Executive Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Richard J. Smith President, Entergy Wholesale Commodity Business	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Gary J. Taylor Group President, Utility Operations	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Leo P. Denault Executive Vice President and chief Financial Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Mark T. Savoff Executive Vice President and Chief Operating Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Roderick K. West Executive Vice President and Chief Administrative Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Renae E. Conley Executive Vice President, Human Resources and Administration	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
John T. Herron President and Chief Executive Officer Nuclear Operations/Chief Nuclear Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Robert D. Sloan Executive Vice President Senior Vice President and Chief Accounting Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Theodore H. Bunting, Jr. Senior Vice President and Chief Accounting Officer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113

Joseph T. Henderson Senior Vice President and General Tax Counsel	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Terry R. Seamons Senior Vice President, Organizational Development	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113
Steven C. McNeal Vice President and Treasurer	Entergy Corporation 639 Loyola Avenue New Orleans, LA 70113

The names and addresses of the board of directors of EOI are as follows. Members of the board are all US citizens.

Jeffrey S. Forbes Director	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
John T. Herron Director	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Timothy G. Mitchell Director	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213

The names and addresses of the principal officers of EOI are as follows. The principal officers are all US citizens.

John T. Herron President and Chief Executive Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Joseph A. Kowalewski Senior Vice President, Chief Operating Officer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Robert D. Sloan Executive Vice President, General Counsel and Secretary	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213

Wanda C. Curry Vice President, Chief Financial Officer - Nuclear Operations	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Clifford Eubanks Vice President, Project Management	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Donna Jacobs Vice President, Site (Waterford 3)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Oscar Limpias Vice President, Engineering	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Steven C. McNeal Vice President and Treasurer	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Kevin J. Mulligan Vice President, Operations	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Eric W. Olson Vice President, Site (River Bend Station)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Michael Perito Vice President, Site (Grand Gulf Nuclear Station)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213
Christopher J. Schwarz Vice President, Site (Arkansas Nuclear One)	Entergy Operations, Inc. 1340 Echelon Parkway Jackson, MS 39213

The names and addresses of the board of directors of SERI are as follows. Members of the board are all US citizens.

John T. Herron Chairman	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213

Leo P. Denault Director	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Steven C. McNeal Director	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213

The names and addresses of the principal officers of SERI are as follows. The principal officers are all US citizens.

John T. Herron President and Chief Executive Officer	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Robert D. Sloan Executive Vice President, General Counsel and Secretary	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Theodore H.Bunting, Jr. Senior Vice President and Chief Accounting Officer	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Wanda C. Curry Vice President, Chief Financial Officer – Nuclear Operations	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213
Steven C. McNeal Vice President and Treasurer	System Energy Resources, Inc. 1340 Echelon Parkway Jackson, Mississippi 39213

The names and addresses of the board of directors of SMEPA are as follows. Members of the board are all US citizens. Because it is a cooperative, SMEPA's board of directors consists of two representatives from each member electric power association.

<u>Coahoma EPA</u> General Manager: Keith Hurt Director: William Hardin	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849

<u>Coast EPA</u>
President/CEO: Robert Occhi
Director: Charles A. Lopez

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Delta EPA</u>
General Manager: Ronnie Robertson
Director: Henry Waterer

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Dixie EPA</u>
General Manager: Randy Smith
Director: Mack Mauldin

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Magnolia EPA</u>
Manager: Darrell Smith
Director: Jerry Sisco

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Pearl River Valley EPA</u>
General Manager: Randy Wallace
Director: Joe Shelton III

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Singing River EPA</u>
General Manager/CEO: Lee Hedegaard
Director: Roy Grafe

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Southern Pine EPA</u>
General Manager: Don Jordan
Director: Mickey Berry

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Southwest MS EPA</u>
General Manager: Percy McCaa
Director: Greg Kitchens

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

<u>Twin County EPA</u>
Manager: John Mosley
Director: Jack Reed

South Mississippi Electric Power Association
7037 US HWY 49
P.O. Box 15849
Hattiesburg, MS 39404-5849

Yazoo Valley EPA General Manager: Charles H. Shelton Director: Louie Thompson	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849

The names and addresses of the principal officers of SMEPA are as follows. The principal officers are all US citizens.

Jim Compton General Manager/CEO	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849
Marcus Ware Assistant General Manager	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849
Ray Haley Chief Financial Officer	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849
Terry Lee Chief Engineering Officer	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849
Nathan Brown Chief Operating Officer	South Mississippi Electric Power Association 7037 US HWY 49 P.O. Box 15849 Hattiesburg, MS 39404-5849

1.1.5 Class and Period of License Sought

The applicant requests renewal of the facility operating license for GGNS (facility operating license NPF-29) for a period of 20 years. The license was issued under Section 103 of the Atomic Energy Act of 1954 as amended. License renewal would extend the facility operating license from midnight, November 1, 2024, to midnight, November 1, 2044.

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 license.

1.1.6 Alteration Schedule

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

1.1.7 Regulatory Agencies with Jurisdiction

Regulatory agencies with jurisdiction over the station are listed below.

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

Mississippi Public Service Commission
P. O. Box 1174
Jackson, MS 39125

1.1.8 Local News Publications

The trade and news publications which circulate in the area surrounding GGNS, and which are considered appropriate to give reasonable notice of the renewal application to those municipalities, private utilities, public bodies, and cooperatives that might have a potential interest in the facility, include the following.

The Clarion-Ledger
201 South Congress St.
Jackson, MS 39201

The Sun Herald
300 Mississippi St.
Jackson, MS 39201

The Vicksburg Post
1601 N. Frontage Road #F
Vicksburg, MS 39180

Port Gibson Reveille
708 Market Street
Port Gibson, MS 39150

Madison Journal
300 South Chestnut Street
Tallulah, LA 71282

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.” The current indemnity agreement (No. B-72) for GGNS states in Article VII that the agreement shall terminate at the time of expiration of the license specified in Item 3 of the Attachment to the agreement, which is the last to expire. Item 3 of the Attachment to the indemnity agreement, as revised by Amendment No. 4, lists GGNS operating license number NPF-29. The applicant requests that any necessary conforming changes be made to specify the extension of the agreement until the expiration of the renewed GGNS facility operating license sought in the application. In addition, should the license number change upon issuance of the renewed license, the applicant requests that conforming changes be made to Item 3 of the Attachment, and other sections of the indemnity agreement, as appropriate.

1.1.10 Restricted Data Agreement

This application does not contain restricted data or national security information, and the applicant does not expect that any activity under the renewed license for GGNS 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 Parts 10 CFR 25 or 10 CFR 95, respectively.

1.2 PLANT DESCRIPTION

The GGNS site is located in Claiborne County, Mississippi, on the east bank of the Mississippi River, approximately 25 miles south-southwest of Vicksburg, Mississippi, and 37 miles north-northeast of Natchez, Mississippi. The site is bounded by the Mississippi River on the west and by land owned by others on the north, south, and east.

GGNS uses a single cycle, forced circulation, boiling water reactor (GE BWR-6). General Electric Company (GE) furnished the nuclear steam supply system (NSSS) and Allis-Chalmers Power Systems furnished the turbine generator set. The Grand Gulf containment is a Mark III BWR containment incorporating the drywell/pressure suppression concept. The containment is a steel-lined reinforced concrete structure designed by Bechtel Power Corporation. The NSSS is licensed to generate 3898 megawatts-thermal (MWt).

Upon approval for an extended power uprate (EPU) scheduled to occur in 2012, the licensed thermal power level will be 4408 MWt. The planned EPU is a constant pressure power uprate that maintains the same maximum operating primary system pressure. Changes to operating parameters due to the increase in power were considered during preparation of the license renewal application. A specific example is the higher resulting neutron fluence values used in evaluation of time-limited aging analyses in Section 4.2. The small changes in operating parameters due to the uprated power level have little effect on aging effects requiring management. Changes to the current licensing basis (CLB) due to future plant modifications or analyses to support operation at EPU conditions that materially affect the contents of the LRA will be submitted in an annual update in accordance with 10 CFR 54.21(b).

The principal structures of the station consist of the containment building, turbine building, auxiliary building, control building, diesel generator building, standby service water cooling towers and basins, enclosure building, radwaste building, independent spent fuel storage installation, radial collector well system, auxiliary cooling tower, natural draft cooling tower and office building.

The original application for a license at GGNS was submitted to operate a two-unit nuclear power facility. In December of 1979, construction of GGNS Unit 2 (GGN2) was deferred in order to concentrate resources on the completion of GGNS Unit 1. The Construction Permit for GGN2 was formally cancelled by the USNRC in August 1991. Structures intended for GGN2 remain partially completed on the site.

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 GGNS 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 (EIC) systems.

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

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

Table 2.0-1
Component Intended Functions: Abbreviations and Definitions

Abbreviation	Intended Function	Definition
CE	Conducts electricity	Provide electrical connections to specified sections of an electrical circuit to deliver voltage, current or signals.
EN	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.
FLV	Floodable volume	Maintain boundary of a volume in which the core can be flooded and adequately cooled in the event of a breach in the nuclear system process barrier external to the reactor vessel.
HS	Heat sink	Provide heat sink during station blackout or design basis accidents (includes source of cooling water for plant shutdown).
HT	Heat transfer	Provide ability to transfer heat.
IN	Insulation (electrical)	Insulate and support an electrical conductor.
INS	Insulation	Provide insulating characteristics to reduce heat transfer.
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).
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 (10 CFR 54.4(a)(1)).
STR	Structural integrity	Maintain structural integrity of reactor vessel internals components such that loose parts are not introduced into the system.
STRSP	Structural support	Provide structural or functional support for reactor vessel or reactor vessel internals 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 GGNS 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 GGNS 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 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 EIC systems are included in the scope of license renewal by default. EIC components in mechanical systems are included in the evaluation of EIC components, regardless of whether the mechanical system is included in scope. Intended functions for EIC systems are not identified since the bounding (i.e., included by default) scoping approach makes it unnecessary to determine if an EIC system has an intended function. Switchyard equipment, which is not part of the plant's EIC 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 GGNS scoping for station blackout, 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, plant layout drawings, Fire Hazards Analysis, design criteria documents, and maintenance rule basis documents. The 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, Technical Specifications, the Fire Hazards Analysis (Appendix 9A of the UFSAR), the Appendix R Safe Shutdown Analysis, Maintenance Rule basis documents, design basis documents, and various station drawings as necessary.

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 50.54(a)(1). Design basis events are defined in 10 CFR 50.49(b)(1)(ii) as conditions of normal operation, including anticipated operational occurrences, design basis accidents, external events, and natural phenomena for which the plant must be designed to ensure functions identified in 10 CFR 54.4(a)(1)(i) through (iii). The design basis events include the design basis accidents described in Chapter 15 of the UFSAR and events described in other parts of the licensing basis documentation, such as floods, fires, tornados, seismic events, and high energy line breaks.

An Entergy corporate procedure provides the criteria and methodology for determining and evaluating the safety and quality classification of systems, structures and components. The procedure defines design basis events consistent with 10 CFR 50.49 (b)(1) and defines safety-related, or quality assurance Category SR, to include those structures, systems and components that are relied upon to remain functional during and following design basis events to assure the following:

- The integrity of the reactor coolant pressure boundary; or
- The capability to shut down the reactor and maintain it in a safe shutdown condition; or
- The capability to prevent or mitigate the consequences of accidents which could result in potential offsite exposures comparable to the applicable guideline exposures set forth in 10 CFR 50.34(a)(1), 10 CFR 50.67, or 10 CFR 100.11, as applicable.

This is essentially the same definition used for safety-related SSC in 10 CFR 54.4(a)(1). Section 50.34(a)(1)(i) refers to Part 100 and therefore imposes no additional requirements. Section 50.34(a)(1)(ii) is not applicable as the GGNS construction permit was issued before January 10, 1997.

As stated above, Entergy corporate procedures control component and structure quality classification. The GGNS equipment database maintains the controlled component level list of quality classifications.

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 and from design criteria documents for those systems for which a document was written. Mechanical systems whose only safety-related components are EIC components or structural components are not included in scope for this criterion; however, the EIC 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, 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 EIC 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.

2.1.1.2.1 Functional Failures of Nonsafety-Related SSCs

At GGNS, systems and structures required to perform a function to support a safety function are generally 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 in closed systems supporting the secondary containment pressure boundary), 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), the connected piping and supports up to and including the first seismic or equivalent anchor beyond the safety-nonsafety interface are within the scope of license renewal.

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

Spatial interactions can occur as (1) physical impact or flooding; (2) pipe whip, jet impingement, or harsh environments (such as caused by a high energy line break (HELB)); or (3) spray or leakage.

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).

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.

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 utilized 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.

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 EIC 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, GGNS fire protection documents were reviewed.

UFSAR Section 9.5.1 describes the fire protection system and the 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. The documents detailing compliance with the subject requirements and forming the basis of the fire protection program are as follows:

- Fire Protection Program as described in Appendix 9B of UFSAR and the Fire Protection Plan Administrative Procedure.
- Fire Hazards Analysis Report (FHAR) (Appendix 9A of UFSAR).
- Analysis of Safe Shutdown (Appendix 9C of UFSAR).
- Safe Shutdown Equipment List.
- Technical Requirements Manual.

The Fire Protection Program Plan as required by 10 CFR 50.48 is included in the GGNS UFSAR and the Fire Protection Plan Administrative Procedure. The Fire Protection Program Plan discusses the purpose, design, implementation and maintenance of the program. It states the fire protection objectives and defines the program bases and key elements. The Fire Protection Plan identifies the fundamental fire protection documents, describes the method of compliance, and provides an explanation of the organization, responsibilities, and administrative controls which comprise the Fire Protection Program.

The plant FHAR compares the design of the program with the performance-related fire protection objectives, such as combustible loading, adequacy of suppression systems and fire barriers.

The FHAR documents by fire zone the presence of safety-related equipment and safe shutdown systems, components, and devices.

The Analysis of Safe Shutdown describes GGNS strategy and corresponding analysis that assures safe shutdown of the plant in the event of a fire in accordance with 10 CFR 50, Appendix R.

The Safe Shutdown Equipment List identifies those systems and components necessary to shutdown the plant and maintain it in a safe shutdown condition.

The Technical Requirements Manual contains operational system testing and surveillance requirements.

Based on the review of the GGNS 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 GGNS 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.

- Operate as defined by the safe shutdown capability analysis to assure safe shutdown of the plant in the event of a fire in accordance with 10 CFR 50, Appendix R (such as the nuclear boiler system, residual heat removal system, reactor core isolation cooling system).

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 GGNS structures.

As described in Section 2.1.1, plant EIC 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 GGNS Environmental Qualification (EQ) 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 EIC 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. As a boiling water reactor, GGNS is not subject to this regulation.

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. GGNS UFSAR Section 15.8 identifies system functional requirements for 10 CFR 50.62.

Based on GGNS current licensing bases for ATWS, system intended functions performed in support of 10 CFR 50.62 requirements were determined. The results of this determination are provided for mechanical systems in Section 2.3.

As described in Section 2.1.1, plant EIC systems are included in the scope of license renewal by default. Consequently, EIC 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, a station blackout is the loss of offsite power and unavailability of the 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.

Appendix 8A of the UFSAR summarizes the licensing bases for SBO at GGNS. GGNS 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 GGNS mechanical systems.

Based on NRC guidance in NUREG-1800 Section 2.5.2.1.1, certain switchyard components required to restore offsite power to recover from an SBO 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 station blackout (10 CFR 50.63).

As described in Section 2.1.1, plant EIC 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 EIC 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 CLB 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 GGNS 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 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.

As discussed in Section 2.1.1.2, physical failures 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).

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

In order to ensure the nonsafety-related portions of high-energy lines were included in the 10 CFR 54.4(a)(2) review, the GGNS UFSAR and associated site documentation were reviewed. The review of high energy line breaks (HELB) for GGNS is contained in UFSAR Appendix 3C.

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 GGNS 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 in order 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 2.3.1.7, 2.3.2.8, 2.3.3.19, and 2.3.4.2).

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 oil, steam or liquid 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.

- Auxiliary building
- Containment structure
- Control building
- Diesel generator building
- Drywell
- Standby service water cooling towers and basin
- 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.

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 EIC aging management review evaluates commodity groups containing components with similar characteristics. Screening applied to commodity groups determines which EIC 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. GGNS electrical commodity groups were compared to the NEI 95-10, Appendix B EIC commodity groups. GGNS electrical commodity groups that correspond to the two NEI 95-10 passive EIC commodity groups are considered to be passive. These are the GGNS electrical commodity groups that meet 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):

- High voltage insulators, and
- Cables and connections, bus, electrical portions of EIC penetration assemblies, fuse holders outside of cabinets of active electrical components.

The commodity group “cables and connections, bus, electrical portions of EIC penetration assemblies, fuse holders outside of cabinets of active electrical components” is subdivided as shown in Table 2.5-1. Other GGNS EIC commodity groups are active and do not require aging management review.

EIC 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 EIC components is addressed in the mechanical review.

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

2.1.2.3.2 Long-Lived Screening

Electrical components and EIC penetration assemblies included in the environmental qualification (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 at GGNS complies with the applicable safety standards (e.g., BTP-APCSB 9.5.1, National Fire Protection Association document NFPA-10 for fire extinguishers, NFPA-1962 for fire hoses, NFPA Standard-1981 for SCBA air cylinders, 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, while these consumables are in the scope of license renewal, they do not require an aging management review.

2.1.3 Interim Staff Guidance Discussion

As discussed in NEI 95-10 (Ref. 2.1-6), 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 single remaining ISG relevant to the LRA is the following.

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

The final LR-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 GGNS SAMA analysis presented in Appendix E of this application.

2.1.4 Generic Safety Issues

In accordance with the guidance in NEI 95-10, 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 that involve an issue related to the license renewal aging management review or time-limited aging analysis evaluations are to be addressed in the LRA. Based on NUREG-0933 (Ref. 2.1-5), the GSI review determined that there are no issues involving either aging effects for SCs subject to an aging management review or TLAAs relevant to the license renewal application.

2.1.5 Conclusion

The methods described in Sections 2.1.1 and 2.1.2 were used at GGNS 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 U.S. Nuclear Regulatory Commission, NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, December 2010.

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

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

2.1-5 U.S. NRC, NUREG-0933, *Resolution of Generic Safety Issues (Formerly entitled "A Prioritization of Generic Safety Issues")*, August 2010 (Appendix B, Applicability of NUREG-0933 Issues to Operating and Future Reactor Plants, Revision 24, June 30, 2010).

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

2.1-7 Nuclear Energy Institute, NEI 05-01, *Severe Accident Mitigation Alternatives (SAMA) Analysis Guidance Document*, 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 NUREG-1950, *Disposition of Public Comments and Technical Bases for Changes in the License Renewal Guidance Documents NUREG-1801 and NUREG-1800,* April 2011, Table A-8, “Summary of Changes to the Updated LIcense Renewal Documents as a Result of License Renewal Interim Staff Guidance (LR-ISG).”

2.2 PLANT LEVEL SCOPING RESULTS

Tables 2.2-1-A, 2.2-1-B, and 2.2-3 list the mechanical systems, EIC systems, and structures, respectively, that are within the scope of license renewal for GGNS. 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.

The list of systems used in these tables and determination of system boundaries is based on the GGNS 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 2.3.1.2, and containment penetrations from various systems are grouped into one containment penetrations review in Section 2.3.2.7. For each system, the discussion under “Components Subject to Aging Management Review” provides further information.

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 2.3.1.7, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2); Section 2.3.2.8, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2); Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2); and Section 2.3.4.2, 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, plant layout drawings, Fire Hazards Analysis Report, design criteria documents, and maintenance rule basis documents. 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 EIC equipment, all plant EIC 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 EIC 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
B13	Reactor System	Section 2.3.1, Reactor Coolant System
B21	Nuclear Boiler System	Section 2.3.1.3, Nuclear Boiler System
B33	Reactor Recirculation System	Section 2.3.1.4, Reactor Recirculation System
C11	Control Rod Drive (CRD) Hydraulic System	Section 2.3.3.1, Control Rod Drive
C34	Feedwater Control	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
C41	Standby Liquid Control (SLC) System	Section 2.3.3.2, Standby Liquid Control
C51	Neutron Monitoring System	Section 2.3.1.5, Neutron Monitoring
C61	Remote Shutdown System	Section 2.3.4.1, Condensate and Refueling Water Storage and Transfer
D17	Process Radiation Monitoring System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
D23	Drywell Monitoring System	Section 2.3.2.7, Containment Penetrations
E12	Residual Heat Removal (RHR) System	Section 2.3.2.1, Residual Heat Removal
E21	Low Pressure Core Spray (LPCS) System	Section 2.3.2.2, Low Pressure Core Spray
E22	High Pressure Core Spray (HPCS) System	Section 2.3.2.3, High Pressure Core Spray
E30	Suppression Pool Makeup System	Section 2.3.3.3, Suppression Pool Makeup
E31	Leak Detection System	Section 2.3.3.4, Leakage Detection and Control
E32	Main Steam Isolation Valve (MSIV) Leakage Control System	Section 2.3.3.4, Leakage Detection and Control
E38	Feedwater Leakage Control System	Section 2.3.3.4, Leakage Detection and Control
E51	Reactor Core Isolation Cooling (RCIC) System	Section 2.3.2.4, Reactor Core Isolation Cooling
E61	Combustible Gas Control System	Section 2.3.3.5, Combustible Gas Control

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

System Code	System Name	LRA Section Describing System
F11–F17	Servicing Equipment	Section 2.3.3.6, Fuel Pool Cooling and Cleanup
G33, G36	Reactor Water Cleanup (RWCU) System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
G41, G46	Fuel Pool Cooling and Cleanup System	Section 2.3.3.6, Fuel Pool Cooling and Cleanup
G50	CRD Maintenance Facility, Flush Tank Filter and Leak Test System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
J11	Fuel	Section 2.3.1.6, Fuel
M23	Hatches and Locks	Section 2.3.3.11, Compressed Air
M24	Drywell, Suppression Pool, and Upper Containment Pool	Section 2.3.2.1, Residual Heat Removal
M41	Containment Cooling System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
M51	Drywell Cooling System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
M61	Containment Leak Rate Test System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
M62	Quencher Confirmatory Test Program	Section 2.3.2.5, Pressure Relief
M71	Containment and Drywell Instrumentation and Control	Section 2.3.2.7, Containment Penetrations
N11	Main and Reheat Steam System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N12	Auxiliary Steam System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
N19, N21	Condensate and Feedwater System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

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

System Code	System Name	LRA Section Describing System
N22	Condensate Cleanup System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N23	Heater, Vents, and Drains System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N30–N32	Main Turbine and Auxiliaries	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N33	Main and Reactor Feed Pump (RFP) Turbine Seal Steam and Drain System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N34	Lube Oil System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N35	Moisture Separator-Reheater Vents and Drains System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N36	Extraction Steam System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N37	Turbine Bypass System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N41	Generator	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N42	Seal Oil System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N43	Generator Primary Water System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

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

System Code	System Name	LRA Section Describing System
N51	Excitation System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N62	Condenser Air Removal System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N64, N65	Low Temperature Offgas System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N71	Circulating Water System	Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
P11	Condensate and Refueling Water Storage and Transfer System	Section 2.3.4.1, Condensate and Refueling Water Storage and Transfer
P21	Make Up Water Treatment System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P33	Process Sampling System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P41	Standby Service Water System	Section 2.3.3.7, Standby Service Water
P42	Component Cooling Water System	Section 2.3.3.8, Component Cooling Water
P43	Turbine Building Cooling Water System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P44	Plant Service Water System	Section 2.3.3.9, Plant Service Water
P45, P46, P48	Floor and Equipment Drainage System	Section 2.3.3.10, Floor and Equipment Drainage
P51, P52, P53	Compressed Air Systems	Section 2.3.3.11, Compressed Air
P60	Suppression Pool Cleanup System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

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

System Code	System Name	LRA Section Describing System
P64	Fire Protection System	Section 2.3.3.12, Fire Protection – Water Section 2.3.3.13, Fire Protection – Halon and CO2
P66	Domestic Water System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P71	Plant Chilled Water System	Section 2.3.3.14, Plant Chilled Water
P72	Drywell Chilled Water System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P75	Standby Diesel Generator System	Section 2.3.3.15, Standby Diesel Generator
P81	HPCS Diesel Generator System	Section 2.3.3.16, HPCS Diesel Generator
P87	NobleChem™ Injection and Monitoring System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
T41	Auxiliary Building Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
T42	Fuel Handling Area Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
T46	Engineered Safety Features (ESF) Electrical Switchgear Rooms Cooling System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
T48	Standby Gas Treatment System	Section 2.3.2.6, Standby Gas Treatment
T51	Emergency Pump Room Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
U41	Turbine Building Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
X77	Diesel Generator Building Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
Y47	Standby Service Water Pumphouse Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
Y67	Fire Water Pumphouse Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning

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

System Code	System Name	LRA Section Describing System
Z17	Control Building Heating, Ventilation and Air Conditioning (HVAC) System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
Y70, Z18	Sanitary Waste Systems	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
Z51	Control Room HVAC System	Section 2.3.3.17, Control Room Heating, Ventilation and Air Conditioning
Z77	Emergency Switchgear and Battery Rooms Ventilation System	Section 2.3.3.18, Heating, Ventilation and Air Conditioning

Table 2.2-1-B
Plant EIC Systems within the Scope of License Renewal

System Code	System Name	UFSAR Reference
C71	Reactor Protection System	Section 7.2
C82	Plant Annunciator System	Section 7*
C84	Meteorological Monitoring System	Section 2.3.3
C85	Seismic Instrumentation System	Section 3.7.4
C86	Vibration Monitoring System	Section 3.9.2.4
C87	Loose Parts Monitoring System	Section 4.4.6.1
C88	Transient Test System	Section 8.3.1.1
C91	Computer System	Section 7*
C93	Emergency Response Facilities	Section 18.2
D21	Area Radiation Monitoring System	Section 12.3.4.1
H13	Control Room Panels	Section 7.1.2.2.5.3
L11	125 volt (V) Batteries	Section 8.3.2.1.1
L20	24V Batteries, Switchgear, and Distribution Panels	Section 8.3.2.1.4
L21	125V Switchgear and Distribution Panels	Section 8.1
L22	250V Switchgear and Distribution Panels	Section 8.1
L50	24V Battery Chargers	Section 8.3.2.1.4
L51	125V Battery Chargers	Section 8.3.2.1.1
L62	Inverters	Section 8.3.1.1.4.1.4, Section 5
M92, T92, U92, V92, W92, Y92, Z92	Lighting, Communications, and Fire Alarm	Section 9.5.1, 9.5.2, 9.5.3
P65	Fire Detection System	Section 9.5.1.2.2.7
R11	4.16 kV Power Transformers (including the 34.5 kV Grounding Transformer	Section 8.1, Section 8.3
R12	6.9 kV Power Transformers	Section 8.3
R13	13.8 kV Boiler Transformers	Section 8.3

Table 2.2-1-B (Continued)
Plant EIC Systems within the Scope of License Renewal

System Code	System Name	UFSAR Reference
R14	Main Step-Up Transformers	Section 8.1
R15	34.5 kV Service Power Transformers	Section 8.2
R18	120/280V Distribution, or Lighting Transformers	Section 8.3
R20	480V Load Centers or Motor Control Centers	Section 8.3
R21	4.16 kV Switchgear and Load Shedding and Sequencing Panels	Section 8.3
R22	6.9 kV Switchgear	Section 8.3
R23	13.8 kV Switchgear	Section 8.3
R24	22 kV Generator Iso Phase Bus	Section 1.2.2.6
R25	34.5 kV Switchgear	Section 8.2
R26	34.5 kV Bus and Miscellaneous Equipment	Section 8.2
R27	500 kV Circuit Breakers (and 115 kV Motor Operated Disconnects)	Section 8.2
R28	12/280V Distribution, or Lighting Panels	Section 9.5.3.2
R60	Penetrations	Section 8.3.1.2.3.1
R61	Public Address and Intercommunications System	Section 9.5.2.2.2
R62	Cathodic Protection System	Section 8.3.1.2.3*, 9.5.4.3*
R63	Electrical Heat Tracing System	Section 7.0*, 9.2.6.2*, 9.3.2.2.3*
R65	Multitone Evacuation Alarm System	Section 9.5.2.1.1
R66	Site Telephone and Fiberoptics	Section 9.5.2.1.1
R93	Grounding Cable	Section 8.3.1.1.6.4
X39	Emergency Operations Facility (EOF) Communications Equipment	Section 9.5.2, Section 18.2
X40	EOF Vent Rad Monitoring System	Section 12.3.3, Section 18.2

*System is not discussed as a stand-alone system.

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

System Code	System Name	UFSAR Reference
C83	Plant Security System	None
G17	Liquid Radwaste System	Section 11.2
G18	Solid Radwaste System	Section 11.4
H22	Local Instrument and Racks	None
N44	Hydrogen (H_2) and Carbon Dioxide (CO_2) System	Section 10.2.5
P47	Plant Service Water Radial Well System	Section 9.2.10
P73	Hydrogen Injection System	Section 1.2.2.5.10 Section 9.5.10
V41	Radwaste Building Ventilation System	Section 9.4.3
V42	Radwaste Building Lab Vacuum System	None
W67	Circulating Water Pumphouse Ventilation System	Section 9.4.9
W70	Auxiliary Cooling Tower Power and Control Building Ventilation System	Section 9.4.9
X37	Warehouse Ventilation System	None
X46	Emergency Operations Facility Emergency Diesel Generator System	None
X47	Emergency Operations Facility HVAC	None
X57	Water Treatment Building Ventilation System	Section 9.4.9
X58	Water Treatment Building Lab Vacuum System	None
Y56	Service Water Intake Structure Ventilation System	Section 9.4.9

Table 2.2-3
Structures within the Scope of License Renewal

Structure Name	LRA Section
Auxiliary Building	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Condensate Storage Tank Foundation	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Condensate Storage and Refueling Water Storage Tank Retaining Basin	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Containment Building	Section 2.4.1, Containment Building
Containment Building (GGN2)	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Control Building	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Control House—Switchyard	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Cranes, Trolleys, Monorails and Hoists	Evaluated as structural components or commodities of the structure in which they are located.
Culvert No. 1 and Drainage Channel	Section 2.4.2, Water Control Structures
Diesel Generator Building	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Diesel Generator Fuel Oil Storage Tanks Access Tunnel	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Fire Water Pumphouse and Water Storage Tanks Foundation	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Manholes and Duct Banks	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Radioactive Waste Building	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Radioactive Waste Building Pipe Tunnel	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Refueling Water Storage Tank Foundation	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures

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

Structure Name	LRA Section
Standby Service Water Cooling Tower and Basin	Section 2.4.2, Water Control Structures
Transformer and Switchyard Support Structures and Foundations	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
Turbine Building	Section 2.4.3, Turbine Building, Process Facilities and Yard Structures

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

Structure Name	Structure Function or UFSAR Reference
Acid Storage Tank Foundation	Section 9.2.3.2
Administration and Shop Building	Provides space for administrative and support personnel.
Auxiliary Building (GGN2)	Construction of the auxiliary building (GGN2) has been abandoned; however, the partially completed building still remains. The structure has no safety function and failure will not compromise any safety-related system or component and will not prevent safe reactor shutdown.
Auxiliary Cooling Tower, Flume and Basin	Section 1.2.2.2 Figure 1.2-16
Auxiliary Cooling Tower Power and Control Building	Section 1.2.2.2
Auxiliary Cooling Tower Substation Foundation	Provides support for electrical components and equipment that service the auxiliary cooling tower.
Chemical Storage Facility	Figure 2.2-5
Circulating Water Pumphouse	Provides support for the circulating water pumps which take suction at the circulating water pumphouse forebay.
Circulating Water Pumphouse (GGN2)	Construction on the upper portion has been abandoned and the lower underground concrete portion is partially completed. The structure was determined to be stable and will not impact existing Unit 1 structures in the area.
Circulating Water Chemical Tanks Foundation and Retaining Walls	Provides space for storage of chemicals and associated equipment used in water treatment.
Clean and Dirty Lube Oil Storage Tank Foundation	Foundation for tanks that provide storage for the site clean and dirty lube oil.
Combination Shop	Provides space for personnel offices and equipment maintenance.
Construction Warehouse	Provides office and work space for maintenance personnel.
Cooling Tower (Natural Draft)	Section 1.2.2.2, Section 10.4.5.3 Figure 1.2-15
Demineralized Water Storage Tank Foundation	Foundation for the demineralized water storage tank, located east of the fire protection pumphouse, which provides storage for processed water from the makeup water treatment system.

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

Structure Name	Structure Function or UFSAR Reference
Discharge Basin	Provides an area for release of liquid effluents associated with plant systems.
Energy Service Center	Provides office and training facilities for plant personnel and contains the emergency operations facility.
Fire Truck Garage	Provides a storage location for the site's fire fighting equipment.
Flammable Liquids/Lubricant Storage Building	Provides a storage area for flammable materials.
GE Warehouse	Provides for storage of the plant's materials and replacement parts.
Guardhouse	Used for security purposes.
Hydrogen Storage Facility	Section 1.2.2.2 and Section 9.5.10.2.1
Hydrogen, CO_2 and Methane (CH_4) Storage Area	Provides storage space for these gases.
Interim Spent Fuel Storage Installation (ISFSI) Pad	Section 9.1.2.4
Low Volume Waste Water Basin	Excavated earthen basin with minor supporting concrete components that contains liquid low level waste.
Modifications and Engineering Building	Formerly the abandoned Unit 2 diesel generator building, the structure provides space for equipment and offices for site personnel.
Oxygen Storage Facility	Section 9.5.10.2.1
Plant Service Water Chemical Tank Foundation and Office Building	Foundation for chemical tanks that provide a source of chemicals for plant service water. The building that encloses the tanks provides for office space and protection against the environment.
Radial Wells and Pumphouse	Section 9.2.10.2 Figure 9.2-27
Regeneration Waste Neutralizing Tank Foundation	Foundation for regeneration waste neutralizing tank, a 30,000-gallon vertical, open top tank located west of the water treatment building that provides storage space for the site's waste water.

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

Structure Name	Structure Function or UFSAR Reference
Site Processing Facility/Fitness for Duty	Houses medical support and personnel processing work space for the site.
Support Services Building	Provides office space for personnel.
Switchyard Office/Construction Building	Provides a work area and office space for the main switchyard.
Turbine Building (GGN2)	Construction of the Unit 2 turbine building has been abandoned; however, the partially completed building still remains. Evaluations verified no impact on Unit 1 buildings.
Unit 2 Warehouse	Provides work space and bulk storage facilities for site materials.
Vehicle Maintenance Building	Provides an area for maintenance of site vehicles and a gasoline island for fueling vehicles.
Warehouse Office Building and Unit 1 Warehouse	The Unit 1 warehouse provides bulk storage facilities and the warehouse office building provides personnel work space.
Water Treatment Building	Houses components used for the permanent plant makeup water treatment system, radiochemistry lab, and counting room equipment.

2.3 SCOPING AND SCREENING RESULTS: MECHANICAL SYSTEMS

2.3.1 Reactor Coolant System

The following systems are described in this section.

- Section 2.3.1.1, Reactor System
  - Section 2.3.1.1.1, Reactor Vessel
  - Section 2.3.1.1.2, Reactor Vessel Internals
- Section 2.3.1.2, Reactor Coolant Pressure Boundary
- Section 2.3.1.3, Nuclear Boiler System
- Section 2.3.1.4, Reactor Recirculation System
- Section 2.3.1.5, Neutron Monitoring
- Section 2.3.1.6, Fuel
- Section 2.3.1.7, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2)

2.3.1.1 Reactor System

System Description

The reactor system (system code B13) consists of the reactor vessel and appurtenances, the reactor vessel internal components of the core, shroud, steam separator and dryer assemblies, and jet pumps. Also included in the reactor system are the control rods, control rod drive housings, and the control rod drives.

Reactor Vessel and Appurtenances

The purpose of the reactor vessel and appurtenances is to contain and support the reactor core and vessel internals and to provide a barrier to the release of radioactive materials from the core. The reactor vessel provides a volume in which the core can be submerged in coolant. The reactor vessel and appurtenances include the vessel shell, top and bottom heads, nozzles and penetrations, internal and external attachments, and vessel supports.

The reactor vessel is a vertical, cylindrical pressure vessel with hemispherical heads of welded construction. The cylindrical shell and bottom hemispherical head of the reactor vessel are fabricated of low alloy steel plate which is clad on the interior with stainless steel weld overlay. The vessel top head is secured to the reactor vessel by studs and nuts.

Vessel nozzles connect the reactor vessel to various systems and components, including feedwater, main steam, recirculation, high pressure and low pressure core spray, residual heat removal/low pressure core injection, standby liquid control, control rod drive mechanisms, in-core flux instrumentation, vents, drains, head seal leak detection piping, vibration instrumentation, and reactor level and pressure sensing lines.

There are multiple attachments to the reactor vessel for supporting various internal components. These internal attachments include guide rod brackets, steam dryer support brackets, dryer hold-down brackets, feedwater sparger brackets, jet pump pads, core spray brackets, and surveillance specimen holder brackets.

There are multiple external attachments to the reactor vessel. The external attachments include top head lifting lugs, refueling bellows support, stabilizer attachment brackets, and thermocouple mountings.

The reactor vessel is supported by a low-alloy steel skirt. The skirt is welded to the bottom of the vessel shell. The skirt rests on a ring girder support on a reinforced concrete pedestal that is integral with the primary containment foundation. The ring girder is secured to the concrete pedestal with anchor bolts.

Reactor Vessel Internals

The purpose of the reactor vessel internals is to properly distribute the flow of coolant delivered to the vessel, locate and support the fuel assemblies, separate moisture from the steam leaving the vessel, and provide an inner volume containing the core that can be flooded following a break in the reactor coolant pressure boundary external to the reactor vessel.

The reactor vessel internals can be divided into two major groups. The core support structures include the control rod guide tubes and thermal sleeves, core plate assembly, fuel supports, shroud, shroud support, and top guide assembly. These structures form partitions within the reactor vessel to sustain pressure differentials within the vessel, direct the flow of the coolant water, and laterally locate and support the fuel assemblies.

The remaining reactor vessel internal components include the core spray lines and spargers, differential pressure and standby liquid control lines, feedwater spargers, fuel support plugs, guide rods, in-core guide tubes, jet pump assemblies, jet pump instruments, low pressure coolant injection (LPCI) coupling, shroud head/steam separator assembly, startup neutron source holder, steam dryers, and surveillance sample holders.

Control Rods, Control Rod Drive Housings, and Control Rod Drives

The control rod drive (CRD) mechanism (drive) used for positioning the control rod in the reactor core is a double-acting, mechanically latched, hydraulic cylinder using water as its operating fluid. The individual drives are mounted on the bottom head of the reactor vessel. The CRD housings are welded into the reactor vessel with their lower end terminating in a flange below the vessel to which the drive is bolted. The control rod drive hydraulic system (system code C11) hydraulically operates the CRD mechanisms (see Section 2.3.3.1, Control Rod Drive for a description of the hydraulic system). The CRD mechanisms operate manually to position the control rods, but act automatically or manually to rapidly insert the control rods (scram) during abnormal conditions requiring rapid shutdown.

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

- Provide a barrier to the release of radioactive materials.
- Provide a volume in which the core can be submerged in coolant.
- Provide structural integrity for reactor vessel internals.
- Maintain reactor coolant pressure boundary.
- Maintain reactor core geometry.
    - Provide a floodable volume in which the core can be adequately cooled in the event of a breach in the reactor coolant pressure boundary external to the reactor vessel.

    - Provide correct coolant distribution.

- Insert all control rods into the core to quickly shut down the reactor in response to a manual or automatic signal.

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

- Maintain the integrity of the steam dryer to assure no impact on safety functions of other components.

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

UFSAR References

Section 3.9.5	Section 4.6
Section 4.1	Section 5.3.1
Section 4.1.2	Section 5.3.3
Section 4.1.3	

Components Subject to Aging Management Review

The control rods are periodically replaced, and as short-lived components, are not subject to aging management review.

The reactor vessel and appurtenances, including the CRD housings, are reviewed in Section 2.3.1.1.1, Reactor Vessel. The reactor vessel internals, including the CRD guide tubes, are reviewed in Section 2.3.1.1.2, Reactor Vessel Internals. The control rod drive mechanisms are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary (RCPB).

License Renewal Drawings

License renewal drawings are not provided for the reactor vessel and the reactor vessel internals. See Section 2.3.1.2, Reactor Coolant Pressure Boundary for license renewal drawings associated with the RCPB.

2.3.1.1.1 Reactor Vessel

Description of Components Subject to Aging Management Review

For the aging management review, the reactor vessel includes the following major subcomponents: shell, bottom head, top head, flanges, studs, nuts, nozzles, caps, welds, and safe ends.

The vessel boundaries considered in this review are typically the weld between the safe end extensions and attached piping or at the interface flange for bolted connections. Thermal sleeve extensions that are welded to vessel nozzles or safe ends, thermal sleeves, CRD housings, incore housings, bolting, vessel support skirt, vessel interior welded attachments, and vessel external attachments are evaluated.

Applicable UFSAR sections describe how the reactor vessel and its appurtenances constitute a fission product barrier and provide support to withstand adverse combinations of loading and forces resulting from normal, abnormal, and emergency conditions.

Table 2.3.1-1 lists the reactor vessel components that require aging management review and their intended functions.

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

UFSAR References

Section 4.1

Section 5.1

Section 5.2

Section 5.3

2.3.1.1.2 Reactor Vessel Internals

Description of Components Subject to Aging Management Review

The evaluation boundaries for the aging management review include the subcomponent groups identified in Section 2.3.1.1 under reactor vessel internals. The following discussion clarifies which components are subject to aging management review.

Control Rod Guide Tubes

The control rod guide tubes (CRGTs) support the fuel and control rods and as such are subject to aging management review. The CRD thermal sleeves lock the CRGTs into position and are also subject to aging management review. The CRGTs and CRD thermal sleeves are reviewed in this LRA section.

CRD housings are reviewed in Section 2.3.1.1.1, Reactor Vessel. The Class 1 CRD mechanisms are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. The remainder of the CRD hydraulic system is reviewed in Section 2.3.3.1, Control Rod Drive.

Core Plate Assembly

The core plate assembly is subject to aging management review since it provides support and guidance to the control rod guide tubes, in-core guide tubes, and peripheral fuel supports. The core plate assembly, including wedges, is reviewed in this LRA section.

Since the lateral loading path of the core plate bolts is accomplished by wedges, no inspection of the hold-down bolts is required. Assuming that all the hold-down bolts failed, the core plate would rise, leading to a detectable change in power performance. This change would allow for safe shutdown. Therefore, the core plate hold-down bolts have no license renewal intended function and are not subject to aging management review. The wedge tack bolts are not subject to aging management review since the wedges would remain in approximately their designed location and would perform their intended function upon failure of the bolts.

Core Spray Lines and Spargers

The core spray lines and spargers function to distribute flow across the core as part of the emergency core cooling system (ECCS) and are subject to aging management review. Boron injection from the standby liquid control (SLC) system is distributed by high pressure core spray (HPCS). Core spray lines and spargers inside the vessel are reviewed in this LRA section.

The nozzle, thermal sleeve, and brackets attached to the vessel wall are reviewed in Section 2.3.1.1.1, Reactor Vessel. The remaining Class 1 components of the core spray system are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Core Support Plate Differential Pressure and Standby Liquid Control Lines

The instrumentation lines provide information on core flow performance for diagnostic purposes, CRD system water differential pressure (ΔP) indication, and core spray piping break detection. A complete loss of integrity at any location along the ΔP/SLC injection pipe during operation will result in a reduction in core plate differential pressure indication, which is detectable in the control room. Failure of this line will not have an adverse impact on achieving safe shutdown. Therefore, the ΔP/SLC lines inside the reactor vessel have no license renewal intended function and are not subject to aging management review.

Boron from the SLC system is injected via core spray.

The ΔP/SLC lines outside the vessel have a safety function and are subject to aging management review. The nozzle is reviewed in Section 2.3.1.1.1, Reactor Vessel. The remaining Class 1 components associated with ΔP/SLC lines are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Feedwater Spargers

The feedwater spargers inside the reactor vessel do not perform any safety function. BWRVIP-06-A reviewed the failure consequences of this subcomponent and determined that disengagement of a feedwater sparger from the inlet nozzle could result in jet impingement on the steam separators, but there would be no safety-related subcomponents in the path of the jet. A loose feedwater sparger also may drop on core spray piping or lodge in the annulus after impacting jet pumps. Failure of a feedwater sparger would be detectable due to changes in feedwater flow balance.

Further, BWRVIP-06-A concludes that there is no significant safety concern from potential loose parts on fuel. There also is no safety concern for interference with main steam isolation valves (MSIVs), control rod operation, damage to reactor internals, corrosion or chemical reaction with other reactor materials, interference with reactor core isolation cooling (RCIC) operation, reactor water cleanup (RWCU) or residual heat removal (RHR) isolation valves, nuclear instrumentation, or RHR pumps and heat exchangers. There could be some possible operating concerns from the potential loose part(s) with regard to fuel fretting, bottom head drain plugging and recirculation system performance, but none of these would negatively affect safe shutdown or increase offsite dose. Consequently this subcomponent has no license renewal intended function and is not subject to aging management review.

The feedwater nozzles, thermal sleeves, and brackets welded to the vessel are reviewed in Section 2.3.1.1.1, Reactor Vessel. The remaining Class 1 components of the feedwater system are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Fuel Supports

The fuel supports provide support to core fuel elements and are subject to aging management review. The fuel support orifices provide the correct core coolant flow distribution. The fuel supports and orifices are reviewed in this LRA section.

Guide Rods

The guide rods are used for alignment of the shroud head and steam dryer during assembly and disassembly of reactor vessel internals. The guide rods serve no safety function. In the unlikely event the guide rods were to come apart during operation, large pieces would likely become lodged on top of the shroud support in the annulus region. BWRVIP-06-A reviewed failure consequences of loose parts similar to the guide rods and concluded these loose parts are unlikely to create an unsafe condition. Specifically, failure of a guide rod or its support brackets could result in a loose part which would be transported into the shroud annulus. Damage to jet pump sensing lines is possible as a result of a loose guide rod. However, failure of a jet pump sensing line is detectable, and the components are not safety-related. Consequently the guide rod subcomponents have no license renewal intended function and are not subject to aging management review.

The guide rod attachment brackets, as attachments to the reactor vessel, are covered in Section 2.3.1.1.1, Reactor Vessel.

In-Core Instrument Flux Monitor Guide Tubes

The in-core guide tubes provide the path for and support of neutron monitoring instruments and are subject to aging management review. The in-core guide tubes are reviewed in this LRA section.

The dry tubes for source range monitor (SRM) and intermediate range monitor (IRM) detectors are inside the reactor vessel and part of the reactor coolant system (RCS) pressure boundary. The dry tubes may be replaced if cracking is discovered, but replacement does not occur on a periodic frequency. The dry tubes are reviewed in this LRA section.

The local power range monitor (LPRM) detector assemblies installed inside the guide tubes and connected to the in-core housing flange form the RCS pressure boundary.

The detector assemblies have a limited life based on exposure and are replaced as required. Therefore, the LPRM assemblies are not subject to aging management review.

The in-core housings, as attachments to the reactor vessel, are reviewed in Section 2.3.1.1.1, Reactor Vessel.

Jet Pump Assemblies

The jet pump assemblies form part of the floodable volume around the core and are subject to aging management review. The jet pump assemblies are reviewed in this LRA section.

The recirculation nozzles, safe ends, and thermal sleeves are reviewed in Section 2.3.1.1.1, Reactor Vessel. The remaining Class 1 recirculation system components outside the reactor vessel are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Jet Pump Instruments

Jet pump flows are an indication of jet pump integrity, and core flow measurement accuracy is affected by sensing line failure. While this instrumentation is required for operation, it is not required for safe shutdown (when jet pumps are not operating). Therefore, jet pump instrumentation inside the vessel has no license renewal intended function and is not subject to aging management review.

The jet pump instrumentation nozzles are reviewed in Section 2.3.1.1.1, Reactor Vessel and addressed by BWRVIP-49-A. The jet pump sensing lines outside the reactor vessel are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Low Pressure Coolant Injection (LPCI) Couplings and Lines

The LPCI system is part of the ECCS and provides cooling of the fuel as necessary during accident conditions. The internal components that form the connection between the vessel nozzles and shroud (LPCI coupling) are safety related and subject to aging management review. The LPCI coupling consists of shroud attachment ring, collar, sleeve, fitting, strut, elbow, elbow extension, and seal piston ring components reviewed in this LRA section. A flow deflector, consisting of a splash plate with four legs welded to the shroud inner wall, is located at the inlet, inside the shroud.

The RHR/LPCI nozzles and thermal sleeves are covered in Section 2.3.1.1.1, Reactor Vessel. The remaining Class 1 components of the RHR/LPCI system are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary.

Shroud

The shroud directs coolant flow through the core, helps maintain fuel alignment to ensure the control rods can be inserted into the core, and forms part of the boundary that maintains coolant level floodable volume in the event of a loss of coolant accident (LOCA). It also provides vertical and lateral support for the shroud head/steam separator, core plate, and grid. This assures that the control rods and ECCS can perform their safety functions. In addition, the shroud also serves as a barrier to separate the upward core flow from the downward annulus flow and supports the core spray spargers. All sections of the shroud are subject to aging management review and reviewed in this LRA section.

Shroud Head and Steam Separator Assembly

The steam separator assembly and shroud head, including hold-down bolting, do not fulfill a safety function. BWRVIP-06-A reviewed the failure consequences of this subcomponent and determined that cracking to the extent of creating a loose part was unlikely to go undetected. Further, BWRVIP-06-A concluded that even if loose parts were generated there is no significant safety concern from those postulated loose parts.

Recent industry operating experience has shown that loose parts generated by the steam dryers can reach the steam lines. However, any loose parts generated by the steam separators would be captured by the steam dryers and would not reach the steam lines. The conclusion of BWRVIP-06-A therefore remains valid for the steam separators even considering recent operating experience. Consequently this subcomponent has no license renewal intended function and is not subject to aging management review.

Shroud Support and Access Hole Cover

The shroud support assembly supports the shroud and core plate and provides a floodable volume, which is a safety function, and thus the assembly is subject to aging management review. The shroud support access hole cover maintains a leak-tight barrier between the annulus and lower plenum, thus maintaining core coverage during a design basis accident. The access hole cover is subject to aging management review. The shroud support and access hole cover are evaluated in this LRA section.

The pad and weld are extensions of the vessel cladding and reviewed in Section 2.3.1.1.1, Reactor Vessel.

Startup Neutron Source Holder

The startup neutron source holder was moved to the spent fuel pool and is not subject to aging management review.

Steam Dryer

The steam dryer does not provide any safety function. BWRVIP-06-A documents that since dryers are visually inspected during removal in outages, significant cracking and associated loose parts due to cracking during the subsequent cycle are unlikely. Further, the report concluded there is no significant safety concern from potential loose parts on fuel and that there is also no safety concern for interference with MSIVs, control rod operation, damage to reactor internals, corrosion or chemical reaction with other reactor materials, interference with core spray or RCIC operation, RWCU or RHR isolation valves, nuclear instrumentation, or RHR pumps and heat exchangers.

However, recent industry experience has shown that cracking to the extent that generates loose parts can occur. Loose parts so generated might interfere with the safety function of other components (e.g., MSIVs). Consequently, the steam dryer is subject to aging management review as a nonsafety-related component whose failure could prevent satisfactory accomplishment of any of the safety functions of other structures, systems, and components. The license renewal intended function of the steam dryer is to maintain structural integrity (i.e., not generate loose parts). The steam dryer is reviewed in this section with the reactor vessel internals.

Surveillance Sample Holders

The surveillance sample holders do not fulfill a safety function. BWRVIP-06-A documents that failure consequences for this type of subcomponent are not expected to create an unsafe condition. Consequently, this subcomponent has no license renewal intended function and is not subject to aging management review.

The surveillance sample holder brackets are welded to the reactor vessel and are reviewed in Section 2.3.1.1.1, Reactor Vessel.

Top Guide Assembly

The top guide assembly, part of the core support structure, maintains alignment and spacing at the top of the fuel assemblies and provides lateral support for the upper end of installed in-core guide tubes. The top guide assembly is subject to aging management review and is reviewed in this LRA section.

Table 2.3.1-2 lists the reactor vessel internals components that require aging management review and their intended functions.

Table 3.1.2-2 provides the results of the aging management review for reactor vessel internals components.

UFSAR References

Section 3.9.5.1

2.3.1.2 Reactor Coolant Pressure Boundary

System Description

This LRA section reviews the components that are part of the RCPB other than the reactor vessel and its internals. UFSAR Section 5.1 defines the RCPB to include all pressure containing components, such as pressure vessels, piping, pumps, and valves, that are part of the reactor coolant system or are connected to the reactor coolant system, up to and including any and all of the following:

- The outermost containment isolation valve in piping which penetrates primary reactor containment.
- The second of the two valves normally closed during normal reactor operation in system piping which does not penetrate primary reactor containment.
- The reactor coolant system safety/relief valve piping.

Components of the RCPB whose failure could cause a loss of reactor coolant at a rate in excess of the normal makeup system capability are ASME Section III Class 1 components (Class 1).

For the intended functions of the systems with components in the RCPB, see the LRA sections listed in Table 2.3.1.2-A.

UFSAR References

Section 5.1

UFSAR references for the systems listed in Table 2.3.1.2-A are provided in the listed LRA section.

Components Subject to Aging Management Review

The majority of the components that comprise the RCPB are from the nuclear boiler system (Section 2.3.1.3) and reactor recirculation system (Section 2.3.1.4). The RCPB review also includes the Class 1 portions of various systems connected to the reactor vessel. Systems with components in the RCPB are listed in Table 2.3.1.2-A with the respective section of the LRA that describes the system.

Table 2.3.1.2-A
Systems with RCPB Components

System Code	RCPB Interconnecting System	LRA Section with System Description
B13	Reactor System (CRD mechanism)	Section 2.3.1.1, Reactor System
B21	Nuclear Boiler System	Section 2.3.1.3, Nuclear Boiler System
B33	Reactor Recirculation System	Section 2.3.1.4, Reactor Recirculation System
C41	Standby Liquid Control System	Section 2.3.3.2, Standby Liquid Control
E12	Residual Heat Removal System	Section 2.3.2.1, Residual Heat Removal
E21	Low Pressure Core Spray System	Section 2.3.2.2, Low Pressure Core Spray
E22	High Pressure Core Spray System	Section 2.3.2.3, High Pressure Core Spray
E31	Leak Detection System	Section 2.3.3.4, Leakage Detection and Control
E32	Main Steam Isolation Valve Leakage Control System (MSIV-LCS)	Section 2.3.3.4, Leakage Detection and Control
E38	Feedwater Leakage Control System	Section 2.3.3.4, Leakage Detection and Control
E51	Reactor Core Isolation Cooling System	Section 2.3.2.4, Reactor Core Isolation Cooling
G33	Reactor Water Cleanup System	Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

Table 2.3.1-3 lists the RCPB components that require aging management review and their intended functions.

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

License Renewal Drawings

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

Table 2.3.1.2-B
RCPB LRA Drawings

System Code	System	RCPB LRA Drawing(s)
B13	Reactor System	LRA-M-1081B (CRD mechanism)
B21	Nuclear Boiler System	LRA-M-1077A LRA-M-1077B LRA-M-1077D LRA-M-1077E
B33	Reactor Recirculation System	LRA-M-1078A LRA-M-1078B LRA-M-1078E
C41	Standby Liquid Control System	LRA-M-1082
E12	Residual Heat Removal System	LRA-M-1085A LRA-M-1085B LRA-M-1085C
E21	Low Pressure Core Spray System	LRA-M-1087
E22	High Pressure Core Spray System	LRA-M-1086
E31	Leak Detection System	LRA-M-1090A
E32	MSIV-LCS	LRA-M-1097
E38	Feedwater Leakage Control System	LRA-M-1112
E51	Reactor Core Isolation Cooling System	LRA-M-1083B
G33	Reactor Water Cleanup System	LRA-M-1079

2.3.1.3 Nuclear Boiler System

System Description

The nuclear boiler (NB) system (system code B21) includes the main steam and feedwater lines and the nuclear pressure relief system and automatic depressurization system components from the main steam lines to the suppression pool. The system also includes other piping components such as vents, drains and instrument lines.

Main Steam and Feedwater Lines

The purpose of the main steam and feedwater lines of the NB system is to provide feedwater to the reactor vessel and transport steam from the vessel to the turbine generator. Nuclear boiler system components supporting the main steam and feedwater lines include piping, valves and associated equipment between the reactor vessel and the turbine building.

Major components of each of the four main steam lines include a flow restrictor, two isolation valves and a shutoff valve. Safety and relief valve piping, drain lines, connections to leakage detection and control systems, and instruments and controls are included. Steam piping to the RCIC turbine is also included.

Each main steam line flow restrictor is a complete assembly welded into the main steam line upstream of the main steam isolation valves. The restrictor limits the coolant blowdown rate from the reactor vessel in the event of a main steam line break outside the containment.

Two air operated MSIVs are welded in a horizontal run of each of the four main steam pipes. The valves close the main steam lines to limit the post-accident release of reactor coolant. The safety-related air supply to the valve operator is from an accumulator (one for each valve) that is also part of the system.

Major components of the two feedwater lines include a shutoff valve, two check valves and a stop valve, connections to the RHR and feedwater leakage control systems, and instruments and controls. Each feedwater line splits into three risers connected to the reactor vessel.

Nuclear Pressure Relief System and Automatic Depressurization System

The purpose of the automatic depressurization system (ADS) is to rapidly reduce reactor vessel pressure in a small break loss-of-coolant accident situation in which the HPCS system fails to maintain the reactor vessel water level. The depressurization provided by the ADS enables the low pressure emergency core cooling systems to deliver cooling water to the reactor vessel. The ADS uses some of the relief valves that are part of the nuclear pressure relief system. The automatic relief valves are arranged to open on conditions indicating that both a break in the reactor coolant pressure boundary has occurred and the HPCS system is not delivering sufficient cooling water to the reactor vessel to maintain the water level above a preselected value.

The nuclear pressure relief system consists of safety/relief valves located on the main steam lines between the reactor vessel and the first isolation valve within the drywell. These valves protect against overpressure of the nuclear system. The valves can actuate by either of two modes: the safety mode or the relief mode. In the safety mode (or spring mode of operation), the direct action of the steam pressure in the main steam lines will act against a spring loaded disk that will pop open when the valve inlet pressure exceeds the spring force. In the relief mode (or power actuated mode of operation), a pneumatic piston or cylinder and mechanical linkage assembly are used to open the valve by overcoming the spring force. In the relief mode, valves may be opened manually or automatically at the selected preset pressure. Eight of the valves that provide the relief function are part of the ADS.

Each of the safety/relief valves used for automatic depressurization is equipped with two air accumulators and associated inlet check valves. The ADS valve air accumulators are recharged by air receivers. The receivers and accumulators ensure that the valves can be held open following failure of the air supply to the receivers.

Each safety/relief valve discharges steam through a discharge line to a point below the minimum water level in the suppression pool.

Other Piping Components

Other piping components within the NB system serve a variety of purposes. The system includes piping and valves that are part of the reactor coolant pressure boundary, such as the reactor vessel head vents, vessel drain lines and instrument lines supporting vessel level and pressure instrumentation. The line from the closure head seal leak detection nozzle to the leak detection system is included. The system also includes piping and valves supporting safety-related drywell and main condenser pressure instrumentation.

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

- Limit the coolant blowdown rate from the reactor vessel in the event of a main steam line break outside the containment.
- Provide steam to the RCIC turbine.
- Prevent over-pressurization of the reactor coolant pressure boundary by use of a pressure relief system.

- Reduce reactor vessel pressure in a LOCA situation in which the HPCS system fails to maintain the reactor vessel water level.
- Support safety-related instrumentation.
- Maintain integrity of reactor coolant pressure boundary.
- Provide a reserve capacity of compressed air (accumulators) for those components requiring a supply of compressed air to provide engineered safety features and containment pressure boundary.
- Support containment pressure boundary.

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

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

UFSAR References

Section 5.4.4	Section 6.3.1.2.4
Section 5.4.5	Section 6.3.2.2.2
Section 5.4.9	Section 7.3.1.1.2.4.1.12
Section 5.2.2.4.1	

Components Subject to Aging Management Review

Class 1 components supporting the reactor coolant pressure boundary and non-Class 1 safety-related components of the NB system are included in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Non-Class 1 safety-related components of the nuclear pressure relief system and automatic depressurization system are reviewed in Section 2.3.2.5, Pressure Relief. The safety-related air receivers, accumulators and related components supporting the MSIVs and ADS valves are reviewed in Section 2.3.3.11, Compressed Air. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.1.7, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2).

This system contains safety-related instrument tubing from the nonsafety-related high pressure condenser that serves the pressure transmitters of the main condenser vacuum trip that close the MSIVs on loss of condenser vacuum (UFSAR, Section 7.3.1.1.2.4.1.12). Since these transmitters fail in a safe position upon loss of pressure, this instrument tubing need not maintain its pressure boundary to perform its safety function and is not subject to aging management review based on the criteria of 10 CFR 54.4(a)(1). However, it is subject to aging management review based on the criteria of 10 CFR 54.4(a)(2).

License Renewal Drawings

For additional details for NB components subject to aging management review, see the LRA drawings listed in the LRA sections referenced under Components Subject to Aging Management Review.

2.3.1.4 Reactor Recirculation System

System Description

The purpose of the reactor recirculation (RR) system (system code B33) is to pump reactor coolant through the core and to control reactor power level through the effects of coolant flow rate on moderator void content. The RR system consists of the two recirculation pump loops external to the reactor vessel. These loops provide the piping path for the driving flow of water to the reactor vessel jet pumps. Each external loop contains one high capacity motor-driven recirculation pump, a hydraulically-actuated flow control valve, and two motor-operated gate valves (for pump maintenance). Each pump suction line contains a flow measuring system. The recirculation loops are part of the reactor coolant pressure boundary and are located inside the drywell structure. The flow control valve hydraulic system (other than the actuator units) is located outside the drywell.

Each recirculation pump is driven by an induction motor and is equipped with mechanical shaft seal assemblies. The two seals built into a cartridge can be readily replaced without removing the motor from the pump.

Reactor coolant pump motor bearings are self-lubricated and the bearing oil is cooled within a reservoir surrounding the bearing. The oil system is not pressurized and no external oil collection system is required.

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

- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

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

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

UFSAR References

Section 5.1

Section 5.4.1

Section 9.5-12

Components Subject to Aging Management Review

Class 1 components supporting the reactor coolant pressure boundary and non-Class 1 safety-related components of the reactor recirculation system are included in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Nonsafety-related components of the hydraulic system that form part of the drywell to containment pressure boundary are conservatively evaluated in Section 2.3.2.7, Containment Penetrations. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.1.7, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2).

License Renewal Drawings

For additional details for RR system components subject to aging management review, see the LRA drawings listed in the LRA sections referenced above.

2.3.1.5 Neutron Monitoring

System Description

The purpose of the neutron monitoring system (system code C51) is to provide indication of neutron flux which can be correlated to thermal power level for the entire range of flux conditions hat can exist in the core. The system includes in-core neutron detectors and out-of-core electronic monitoring equipment which comprise five major subsystems: source range monitor subsystem (SRM), intermediate range monitor subsystem (IRM), local power range monitor subsystem (LPRM), traversing in-core probe subsystem (TIP), and average power range monitor subsystem (APRM).

The SRM and IRM detectors and cable are located inside the reactor vessel in a dry tube sealed against reactor vessel pressure. A remote-controlled detector drive system moves the detector along the dry tube. The dry tubes which contain the SRM and IRM detectors form part of the reactor coolant pressure boundary.

The LPRM assembly consists of four neutron detectors contained in a multiple dry tube assembly. The detectors may be replaced individually from below the vessel. The dry tube assemblies are installed and removed through the top of the vessel. The upper end of the assembly is held to the top fuel guide by means of a spring-loaded plunger. A permanently installed incore guide tube (part of the reactor system, code B13) locates and constrains the assembly. Thimbles (incore housings, also part of the reactor system) welded to the vessel extend to the access area below the vessel where they terminate in a replaceable flange. The flange mates to a machined sealing surface on the incore dry tube assembly. The LPRM detectors assemblies form part of the reactor coolant pressure boundary.

Each LPRM assembly also contains a calibration tube for a traversing in-core probe. The TIP subsystem provides a means to calibrate the individual LPRM sensors by correlating TIP signals to LPRM signals as the TIP is positioned in various radial and axial locations in the core by means of a drive mechanism. A TIP drive mechanism uses a fission chamber attached to a flexible drive cable. The cable is driven from outside the drywell by a gearbox assembly.

The APRM channel uses electronic equipment that averages the output signals from a selected set of LPRMs.

Most neutron monitoring system components are electronic. The SRM and IRM detector dry tubes and the LPRM assemblies support the reactor coolant pressure boundary. The mechanical components of the system have no other safety function.

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

- Maintain integrity of reactor coolant pressure boundary.

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

UFSAR References

Section 7.1.2.1.4

Section 7.6.1.5

Section 7.7.1.6

Components Subject to Aging Management Review

The SRM and IRM detector dry tubes and the LPRM assemblies are evaluated in Section 2.3.1.1.2, Reactor Vessel Internals. The nonsafety-related components of the TIP subsystem that penetrate the drywell to containment pressure boundary are conservatively evaluated in Section 2.3.2.7, Containment Penetrations.

License Renewal Drawings

For additional details for containment penetration components subject to aging management review, see the LRA drawings listed in Section 2.3.2.7, Containment Penetrations.

2.3.1.6 Fuel

System Description

The fuel system code (J11) includes fuel assembly subcomponents. Fuel assemblies are included in scope but are routinely replaced and are not subject to aging management review. The purpose of the fuel assembly is to maintain the nuclear fuel in a controllable and coolable configuration and to retain fission products resulting from power generation.

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

- Provide substantial fission product retention capability during all operational modes.
- Provide sufficient structural integrity to prevent operational impairment of any reactor safety equipment.

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

UFSAR References

Section 4.2

Components Subject to Aging Management Review

Fuel system components are periodically replaced and are not subject to aging management review.

LRA Drawings

Not applicable.

2.3.1.7 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 GGNS, certain components and piping outside the safety class pressure boundary must be structurally sound in order 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 this review. 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 following RCS systems, described in the referenced sections, are within the scope of license renewal based on the criterion of 10 CFR 54.4(a)(2) for physical interactions.

- Section 2.3.1.3, Nuclear Boiler System (B21)
- Section 2.3.1.4, Reactor Recirculation System (B33)

System Descriptions

The miscellaneous RCS 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).

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 in order to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

Series 2.3.1-4-xx tables list the component types for these two systems that require aging management review for 10 CFR 54.4(a)(2) based on potential for physical interactions.

Series 3.1.2-4-xx tables provide the results of the aging management review for these two systems for 10 CFR 54.4(a)(2) based on potential for physical interactions.

System Code	System	Component Types	AMR Results
B21	NB	Table 2.3.1-4-1	Table 3.1.2-4-1
B33	RR	Table 2.3.1-4-2	Table 3.1.2-4-2

License Renewal Drawings

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

System Code	System	LRA Drawing Number	
B21	NB	LRA-M-1077A LRA-M-1077B	LRA-M-1077D LRA-M-1077E
B33	RR	LRA-M-1078A LRA-M-1078C	LRA-M-1078D LRA-M-1078E

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

Component Type	Intended Function
Attachments and Supports	
Reactor vessel external attachments • Support skirt • Stabilizer attachment brackets	Structural support
Reactor vessel internal attachment welds • Core spray brackets • Dryer support brackets • Feedwater sparger brackets • Guide rod brackets • Jet pump pads • Surveillance specimen brackets	Structural support
Reactor vessel internal attachment welds • Dryer holddown brackets	Structural support
Bolting	
Incore housing bolting • CRD flange bolting • Upper head nozzle flange bolting • Vibration instrument flange bolting	Pressure boundary
Reactor vessel closure flange bolting • Closure studs, nuts, washers and bushings	Pressure boundary
Nozzles and Penetrations	
CRD housings	Pressure boundary
Incore housings	Pressure boundary

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

Component Type	Intended Function
Nozzles • Recirc outlet (N1) • Recirc inlet (N2) • Main steam (N3) • Feedwater (N4) • Core spray (N5) • RHR/LPCI (N6) • Head vent (N7) • Spare (N8) • Jet pump instrument (N9) • CRD return (N10) • Drain (N15) • Vibration instrument (N16) • Feedwater (N4) • Core plate pressure/SLC (N11, N18). • Seal leak detection (N17) • Instrumentation (N12, N13, N14)	Pressure boundary
Safe Ends, Thermal Sleeves, Flanges, Caps	
CRD return line cap and weld (N10)	Pressure boundary
Nozzle flanges • Vent/spray nozzle (N7) • Spare head nozzle (N8) • Vibration instrument (N16)	Pressure boundary
Nozzle safe ends ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary

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

Component Type	Intended Function
Nozzle safe ends and extensions ≥ 4” • Steam outlet (N3) • Feedwater inlets (N4) • Core spray inlets (N5) • RHR/LPCI (N6) • Recirculation outlet (N1) • Recirculation inlet (N2) • Jet pump instruments (N9)	Pressure boundary
Nozzle safe ends < 4” • Core plate ΔP (N11, N18) • CRD return line (N10)	Pressure boundary
Thermal sleeves ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary
Thermal sleeve extensions ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary
Welds • Recirc outlet (N1) • Jet pump instrument (N9) • Instruments (N12, N13, N14)	Pressure boundary
Shell and Heads	
Reactor vessel bottom head	Pressure boundary
Reactor vessel shell • Closure flange • Beltline shell rings and connecting welds • Non-beltline shell rings	Pressure boundary
Reactor vessel upper head • Closure flange • Top head (dome)	Pressure boundary

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

Component Type	Intended Function
Control rod guide tubes • Tube, thermal sleeve • Base	Structural support
Core plate assembly	Structural support
Core spray lines and spargers	Flow distribution
Fuel supports • Four-lobe • Peripheral	Structural support
Fuel support orifices	Flow distribution
In-core • Guide tubes • Dry tubes	Structural support
Jet pump assemblies • Riser pipe/elbow/brace • Suction inlet sleeve • Hold-down bolt • Restrainer bracket wedge assemblies • Diffuser shell • Hold-down beam • Diffuser adapter (lower ring) • Transition piece • Suction inlet elbow/nozzle • Mixer adapter and throat (barrel) • Restrainer bracket • Diffuser collar and tailpipe	Floodable volume
Low pressure coolant injection (LPCI) lines • Shroud attachment ring • Collar • Sleeve • Fitting • Elbow extension	Floodable volume

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

Component Type	Intended Function
Low pressure coolant injection (LPCI) lines (cont.) • Strut • Elbow • Flow diverter • Seal/piston rings	Floodable volume
Shroud	Structural support Floodable volume
Shroud support	Structural support
Shroud support • Access hole cover	Floodable volume
Steam dryer	Structural integrity
Top guide assembly	Structural support

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

Component Type	Intended Function
Bolting	Pressure boundary
Condensing chamber	Pressure boundary
Control rod drive	Pressure boundary
Flow element	Pressure boundary Flow control
Heat exchanger assembly	Pressure boundary
Piping (non-Class 1)	Pressure boundary
Piping < 4 inch nominal pipe size (NPS)	Pressure boundary
Piping ≥ 4 inch NPS	Pressure boundary
Pump casing	Pressure boundary
Pump cover	Pressure boundary
Restriction orifice	Pressure boundary Flow control
Restriction orifice (non-Class 1)	Pressure boundary Flow control
Thermal sleeve (non-Class 1)	Pressure boundary
Thermowell	Pressure boundary
Thermowell (non-Class 1)	Pressure boundary
Tubing (non-Class 1)	Pressure boundary
Valve body (non-Class 1)	Pressure boundary
Valve body < 4 inch NPS	Pressure boundary
Valve body ≥ 4 inch NPS	Pressure boundary

Table 2.3.1-4-1
Nuclear Boiler System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	**Intended Function**
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.1-4-2
Reactor Recirculation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Filter housing	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

2.3.2 Engineered Safety Features

The engineered safety features (ESF) are described mainly in UFSAR Chapters 5 and 6.

The following systems are described in this section.[1]

- Section 2.3.2.1, Residual Heat Removal
- Section 2.3.2.2, Low Pressure Core Spray
- Section 2.3.2.3, High Pressure Core Spray
- Section 2.3.2.4, Reactor Core Isolation Cooling
- Section 2.3.2.5, Pressure Relief
- Section 2.3.2.6, Standby Gas Treatment
- Section 2.3.2.7, Containment Penetrations
- Section 2.3.2.8, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2)

1. The UFSAR Section 6.0 defined set of ESF systems is different, in part, from the set of systems described in this section. To simplify the comparison of aging management review results with NUREG-1801, the ESF systems included in this section are those evaluated in NUREG-1801 Chapter V.

2.3.2.1 Residual Heat Removal

System Description

The review of the residual heat removal (RHR) system includes components of the drywell, suppression pool, and upper containment pool system (system code M24) as well as the RHR system code E12.

Residual Heat Removal

The purpose of the RHR system (system code E12) is to remove decay and sensible heat from the reactor vessel and/or the containment under normal operation, shutdown, refueling shutdown, and accident conditions. The RHR system removes decay and sensible heat during and after plant shutdown, injects water into the reactor vessel following a loss-of-coolant accident to reflood the core and maintain fuel cladding below fragmentation temperature, and removes heat from the containment following a loss of coolant accident by cooling and recirculating the suppression pool water and by spraying the containment air space with suppression pool water.

The RHR system is comprised of three independent loops, loops A, B and C. Each loop contains its own motor-driven pump, piping, valves, instrumentation and controls. Each loop has a suction source from the suppression pool and is capable of discharging water to the reactor vessel via a separate nozzle, or back to the suppression pool via a full flow test line. In addition, the A and B loops have heat exchangers which are cooled by the standby service water system. Loops A and B can also take suction from the reactor recirculation system suction or fuel pool and can discharge into the reactor via the feedwater line, LPCI injection lines, fuel pool cooling discharge, or to the containment spray spargers.

A separate auxiliary cooling loop is included in the RHR system with its own pumps, heat exchangers, and controls. Piping in the RHR A, B and C loops is utilized for suction and discharge paths. Cooling water for this auxiliary cooling loop is provided by the plant service water system. The function of the alternate decay heat removal subsystem (ADHRS) is not safety-related; however, various portions are designated as safety-related to ensure that interfacing plant systems are not degraded.

The RHR system has five subsystems or operating modes:

- Residual heat removal mode (shutdown cooling mode).
- LPCI mode.
- Suppression pool cooling mode.
- Containment spray cooling mode.
- Fuel pool cooling assistance.

Residual heat removal mode (shutdown cooling mode) provides the capability to remove decay and sensible heat from the reactor primary system. Two redundant, manually controlled shutdown cooling subsystems of the RHR system provide decay heat removal. Each loop consists of a motor driven pump, two heat exchangers in series, and associated piping and valves. Both loops have a common suction from the same recirculation loop. Each pump discharges the reactor coolant, after circulation through the respective heat exchanger, to the reactor via separate feedwater lines or to the reactor via the LPCI injection path.

LPCI mode provides inventory makeup following pipe breaks. The three RHR motor-driven pumps draw suction from the suppression pool and inject cooling water flow into the reactor core and accomplish cooling of the core by flooding. Each loop has its own suction and discharge piping and separate vessel nozzle which connects with the core shroud through the LPCI couplings to deliver flooding water near the top of the core.

Suppression pool cooling mode removes heat from the suppression pool following a design basis accident. Two redundant RHR suppression pool cooling subsystems circulate water from the suppression pool through the RHR heat exchangers and return it to the suppression pool. RHR service water, circulating through the tube side of the heat exchangers, exchanges heat with the suppression pool water and discharges this heat to the external heat sink.

Containment spray cooling mode sprays into the containment and suppression pool vapor space to reduce internal pressure to below design limits. Containment spray provides containment cooling following a loss of coolant accident, in addition to being a fission product removal mechanism. There are two containment spray subsystems. Each subsystem consists of a suction line from the suppression pool, an RHR pump, a heat exchanger, and three spray spargers inside the primary containment (outside of the drywell) above the refueling floor. Dispersion of the spray water is accomplished by 350 nozzles in each subsystem.

Fuel pool cooling assistance provides cooling to the fuel pool cooling and cleanup (FPCC) system for removing decay heat. RHR pumps A and/or B are used to pump water from the FPCC system through the RHR heat exchangers, and back to the FPCC system. The RHR system can also provide water from the suppression pool or standby service water system as emergency makeup to the spent fuel pool.

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

- In conjunction with other emergency core cooling systems, restore and maintain water level in the reactor vessel for cooling after a loss of coolant accident.
- In conjunction with the automatic depressurization system, provide an alternate shutdown cooling function to remove decay and sensible heat from the reactor core in the event the shutdown suction line from the reactor recirculation system is unavailable.
- Remove heat from the suppression pool following a design basis accident.

- Remove decay and sensible heat from the reactor core to cooldown and maintain the reactor in a cold shutdown condition.
- Assist the FPPC system in removing decay heat from fuel assemblies stored in the fuel pools.
- Remove heat and condense steam from the drywell to prevent overpressurization of the containment following a loss of cooling accident.
- Remove fission products dispersed in the containment atmosphere following a loss of coolant accident.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The RHR 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.
- Provide emergency makeup to the spent fuel pool.

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

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

Drywell, Suppression Pool, and Upper Containment Pool

The drywell, suppression pool, and upper containment pool (DSP&UCP) system code (M24) includes these structural elements of containment along with some mechanical components: the suppression pool ECCS/RCIC suction strainer, suction piping and expansion joints, and the air regulator valves for the gate seals in the upper containment pool. The suppression pool strainer and suction piping provide the safety-grade source of water to the ECCS and RCIC pumps. The nonsafety-related gate seal regulator valves support operation of the upper pool gates during outages; the gates are not required during normal operation.

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

- Provide the safety-grade source of water to the ECCS and RCIC pumps.

The DSP&UCP system has no intended functions for 10 CFR 54.4(a)(2).

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

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

UFSAR References

Residual Heat Removal

Section 1.2.2.3.4

Section 5.4.7

Section 6.3.1.2.3

Section 6.3.2.2.4

Section 6.5.2

Drywell, Suppression Pool, and Upper Containment Pool

Section 6.3.2.2

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Components of the former head spray line (functionally abandoned) that form part of the containment pressure boundary, are evaluated in Section 2.3.2.7, Containment Penetrations. Components of the RHR system supporting the standby service water system pressure boundary are reviewed in Section 2.3.3.7, Standby Service Water. Components forming the connection to the condensate and refueling water storage and transfer system are reviewed in Section 2.3.4.1, Condensate and Refueling Water Storage and Transfer. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not included in other reviews are reviewed in Section 2.3.2.8, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining RHR components are reviewed as listed below.

Suppression pool suction strainer and piping components of the DSP&UCP system are reviewed in Section 2.3.2.2, Low Pressure Core Spray; Section 2.3.2.3, High Pressure Core Spray; Section 2.3.2.4, Reactor Core Isolation Cooling, and in the tables below.

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

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

License Renewal Drawings

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

LRA-M-1061B	LRA-M-1079	LRA-M-1088E
LRA-M-1061C	LRA-M-1085A	LRA-M-1099
LRA-M-1061D	LRA-M-1085B	LRA-M-1112
LRA-M-1077A	LRA-M-1085C	
LRA-M-1077D	LRA-M-1085D	

2.3.2.2 Low Pressure Core Spray

System Description

The purpose of the low pressure core spray (LPCS) system (system code E21), as part of the ECCS, is to limit, in conjunction with the primary and secondary containments, the release of radioactive materials to the environs following a LOCA. The LPCS system pumps water through a peripheral ring spray sparger mounted above the reactor core. The LPCS provides inventory makeup and spray cooling during large breaks when reactor pressures are relatively low. In conjunction with the automatic depressurization system (ADS), LPCS also provides inventory makeup for small breaks after ADS reduces the reactor vessel pressure to the LPCS operating range.

The LPCS system consists of a motor-driven centrifugal pump, piping, valves and associated controls and instrumentation to convey water from the suppression pool to a spray sparger in the reactor vessel above the core (separate from the high pressure core spray (HPCS) sparger). The LPCS injection piping enters the vessel, divides, and enters the core shroud at two points near the top of the shroud. A semicircular sparger is attached to each outlet. Nozzles are spaced around the sparger to spray the water radially over the core and into the fuel assemblies.

The discharge line fill system for LPCS consists of a jockey pump that takes suction from the LPCS pump suction line from the suppression pool. The jockey pump discharges downstream of the check valve on the LPCS pump discharge line.

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

- In conjunction with other available emergency core cooling systems, supply water spray to fuel bundles in the reactor core to prevent excessive fuel cladding temperatures in the event of a loss of coolant accident.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

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

UFSAR References

Section 6.3.1.2

Section 6.3.2.2

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. The spray header internal to the reactor vessel is reviewed in Section 2.3.1.1.2, Reactor Vessel Internals. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.2.8, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining LPCS 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 drawing.

LRA-M-1087

2.3.2.3 High Pressure Core Spray

System Description

The purpose of the high pressure core spray (HPCS) system (system code E22), as part of the ECCS, is to limit, in conjunction with the primary and secondary containments, the release of radioactive materials to the environs following a LOCA. The HPCS system pumps water through a peripheral ring spray sparger mounted above the reactor core. Coolant is supplied over the entire range of system operation pressures. For small breaks that do not result in rapid reactor depressurization, the system maintains reactor water level and depressurizes the vessel. For large breaks the HPCS system cools the core by a spray.

The HPCS system consists of a single motor-driven centrifugal pump located outside the primary containment, and associated system piping, valves, controls, and instrumentation to transfer water from the suction source to a spray sparger in the reactor vessel located above the core (separate from the LPCS sparger). Suction piping is provided from the condensate storage tank (CST) and the suppression pool. Pump suction is normally aligned to the CST source to minimize injection of suppression pool water into the reactor pressure vessel (RPV). However, if the CST water supply is low or the suppression pool level is high, an automatic transfer to the suppression pool water source ensures a water supply for continuous operation of the HPCS system.

After the HPCS injection piping enters the vessel, it divides and enters the shroud at two points near the top of the shroud. A semicircular sparger is attached to each outlet. Nozzles are spaced around the spargers to spray the water radially over the core and into the fuel assemblies.

The discharge line fill system for HPCS consists of a jockey pump that takes suction from the HPCS pump suction line. The jockey pump discharges downstream of the check valve on the HPCS pump discharge line.

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

- Supply flow following reactor scram to depressurize the reactor vessel in the event of a loss of coolant accident. In conjunction with other available emergency core cooling systems, supply water spray to prevent excessive fuel cladding temperatures.
- Supply makeup water to the reactor vessel in the event of loss of main feedwater and/or reactor isolation and failure of the RCIC system.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

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

UFSAR References

Section 6.3.1.2

Section 6.3.2.2

Components Subject to Aging Management Review

The spray sparger and piping inside the vessel are reviewed in Section 2.3.1.1.2, Reactor Vessel Internals. Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. A limited number of components supporting condensate storage tank level instruments are reviewed in Section 2.3.4.1, Condensate and Refueling Water Storage and Transfer. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.2.8, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining HPCS system 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 drawing.

LRA-M-1086

2.3.2.4 Reactor Core Isolation Cooling

System Description

The purpose of the reactor core isolation cooling (RCIC) system (system code E51) is to provide makeup water to the reactor vessel following a reactor vessel isolation accompanied by a loss of coolant flow from the feedwater system to provide adequate core cooling and control of the reactor vessel water level.

The RCIC system consists of a steam-driven turbine pump unit, piping, and valves to provide steam to the turbine, as well as piping and valves to transfer water from the suction source to the core via the feedwater system line. The RCIC turbine oil system supplies cooling and lubricating oil to the turbine bearings and control oil to the governor system.

Suction piping is provided from the CST and the suppression pool. Pump suction is normally aligned to the CST to minimize injection of suppression pool water into the reactor pressure vessel. However, if the CST water supply is low, or the suppression pool level is high, an automatic transfer to the suppression pool water source ensures a water supply for continuous operation of the RCIC system. Water from either source is pumped into the reactor vessel via a residual heat removal system line and then a feedwater line. Flow is distributed within the reactor vessel through the feedwater spargers.

Steam generated by decay heat and residual heat in the reactor is extracted from a main steam line upstream of the associated inboard main steam line isolation valve to drive the turbine. Exhaust steam is discharged to the suppression pool.

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

- Provide makeup water to the reactor vessel following a reactor vessel isolation accompanied by a loss of coolant flow from the feedwater system to provide adequate core cooling and control of the reactor vessel water level.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

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

- Perform a function (maintain isolation of steam supply to the RCIC turbine) 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 5.4.6.2.1

Appendix 8A

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. A small number of penetration guard pipe components are reviewed in Section 2.3.2.7, Containment Penetrations. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.2.8, Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2). Remaining RCIC 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-M-1083A	LRA-M-1085A
LRA-M-1083B	LRA-VPF-KA3622-030

2.3.2.5 Pressure Relief

System Description

The nuclear pressure relief system and automatic depressurization system components, from the main steam lines to the suppression pool, are included in the nuclear boiler system (system code B21). The nuclear boiler system also includes main steam and feedwater lines as well as other piping components such as vents, drains and instrument lines. This section only describes the pressure relief function of the nuclear boiler system. For a complete system description, see Section 2.3.1.3, Nuclear Boiler System.

This review of the pressure relief system also includes the quencher confirmatory test program (QCTP) system code (M62).

Nuclear Pressure Relief System and Automatic Depressurization System

The purpose of the automatic depressurization system (ADS) is to rapidly reduce reactor vessel pressure in a small break loss-of-coolant accident situation in which the HPCS system fails to maintain the reactor vessel water level. The depressurization provided by the ADS enables the low pressure emergency core cooling systems to deliver cooling water to the reactor vessel. The ADS uses some of the relief valves that are part of the nuclear pressure relief system. The automatic relief valves are arranged to open on conditions indicating that both a break in the reactor coolant pressure boundary has occurred, and the HPCS system is not delivering sufficient cooling water to the reactor vessel to maintain the water level above a preselected value.

The nuclear pressure relief system consists of safety/relief valves located on the main steam lines between the reactor vessel and the first isolation valve within the drywell. These valves protect against overpressure of the nuclear system. The valves can actuate by either of two modes: the safety mode or the relief mode. In the safety mode (or spring mode of operation), the direct action of the steam pressure in the main steam lines will act against a spring loaded disk that will pop open when the valve inlet pressure exceeds the spring force. In the relief mode (or power actuated mode of operation), a pneumatic piston or cylinder and mechanical linkage assembly are used to open the valve by overcoming the spring force. In the relief mode, valves may be opened manually or automatically at the selected preset pressure. Eight of the valves that provide the relief function are part of the ADS.

Each of the safety/relief valves used for automatic depressurization is equipped with two air accumulators and associated inlet check valves. The ADS valve air accumulators are recharged by air receivers. The receivers and accumulators ensure that the valves can be held open following failure of the air supply to the receivers.

Each safety/relief valve discharges steam through a discharge line to a point below the minimum water level in the suppression pool.

This review of the pressure relief system only encompasses the lines from the discharge of the safety/relief valves to the suppression pool. Therefore, the intended functions below are the intended functions performed by this portion of the nuclear boiler system. (For a complete list of the intended functions performed by the nuclear boiler system, see Section 2.3.1.3, Nuclear Boiler System.)

The pressure relief portion of the nuclear boiler system has the following intended functions for 10 CFR 54.4(a)(1).

- Prevent over-pressurization of the reactor coolant pressure boundary by use of a pressure relief system.
- Reduce reactor vessel pressure in a LOCA situation in which the HPCS system fails to maintain the reactor vessel water level.

The pressure relief portion of the nuclear boiler system has no intended functions for 10 CFR 54.4(a)(2).

The pressure relief portion of the nuclear boiler system has the following intended function for 10 CFR 54.4(a)(3).

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

Quencher Confirmatory Test Program

The QCTP system code (M62) includes piping, valves and instruments used in the one-time quencher confirmatory test. The objectives of the test were to confirm the validity of the methods used to predict the pressure fields within the containment suppression pool caused by safety/relief valve air clearing loads, to confirm that the piping located within the suppression pool is adequately designed to withstand the air clearing loads, and to measure suppression pool temperature distribution during an extended safety relief valve (SRV) discharge. Some of the components form part of the pressure boundary for the ADS relief valve discharge flowpath. With the exception of the pressure boundary support function, the system has no safety function.

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

- Support ADS pressure boundary.

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

UFSAR References

Section 1.2.2.4.8	Section 6.3.1.2.4
Section 5.2.2	Section 6.3.2.2.2
Section 5.2.2.4	Section 7.3.1.1.1.4
Section 6.2.1.1.3.3.1.1	Appendix 6A: Section 3BA.7.2.2.3
	Appendix 6B (QCTP system code)

Components Subject to Aging Management Review

ASME Class 1 nuclear boiler system components with the intended function of maintaining the reactor coolant pressure boundary and non-Class 1 safety-related components of the nuclear boiler system are reviewed in Section 2.3.1.3, Nuclear Boiler System. The safety-related air receivers, accumulators and related components supporting the MSIVs and ADS valves are reviewed in Section 2.3.3.11, Compressed Air. Nonsafety-related components of the nuclear boiler system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.1.7, Miscellaneous RCS Systems in Scope for 10 CFR 54.4(a)(2). Nuclear boiler system components in the pressure relief portion of the system are reviewed as listed below.

Components of the QCTP system forming part of the ADS pressure boundary are reviewed as listed below.

Table 2.3.2-5 lists the component types that require aging management review.

Table 3.2.2-5 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 drawing.

LRA-M-1077E

2.3.2.6 Standby Gas Treatment

System Description

The purpose of the standby gas treatment system (SGTS) (system code T48) is to minimize exfiltration of contaminated air from the enclosure building, the auxiliary building, and the containment following an accident or abnormal condition that could result in abnormally high airborne radioactivity in these areas. The SGTS ensures that radioactive materials that leak from the primary containment into the secondary containment following a design basis accident (DBA) are filtered and adsorbed prior to exhausting to the environment.

The SGTS consists of two fully redundant subsystems, each with its own set of ductwork, dampers, enclosure building recirculation fan, charcoal filter train, and controls. Each charcoal filter train consists of a demister, electric heater, roughing filter, high efficiency particulate air (HEPA) filter, charcoal adsorber, a second HEPA filter, and a centrifugal fan with inlet flow control vanes.

The demister is provided to remove entrained water in the air, while the electric heater reduces the relative humidity of the airstream. The prefilter removes large particulate matter, while the HEPA filter is provided to remove fine particulate matter and protect the charcoal from fouling. The charcoal adsorber removes gaseous elemental iodine and organic iodides, and the final HEPA filter is provided to collect any carbon fines exhausted from the charcoal adsorber. In consideration of the possibility of iodine desorption and charcoal ignition at elevated temperatures, a water spray system is provided (by fire protection system, P64) for the charcoal adsorber section of the SGTS charcoal filter trains.

The enclosure building recirculation fan and ducts draw air from the auxiliary building, mix this air with air from the enclosure building, and return the mixed air to the enclosure building. A portion of the mixed air is exhausted via the charcoal filter assembly to maintain the SGTS boundary region at a negative pressure.

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

- Provide recirculation, filtration and exhaust of the secondary containment air to maintain a negative pressure in the secondary containment volume and limit release of radioisotopes to the environment under accident conditions.
- Support containment pressure boundary.

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

UFSAR References

Section 6.5.1.1

Section 6.5.3.2

Components Subject to Aging Management Review

SGTS components are reviewed as listed below.

Table 2.3.2-6 lists the component types that require aging management review.

Table 3.2.2-6 provides the results of the aging management review.

License Renewal Drawings

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

LRA-M-1102A

LRA-M-1102B

2.3.2.7 Containment Penetrations

System Description

Primary and secondary containment penetrations in systems that are not included in another aging management review are included in an aging management review for containment penetrations. This grouping of containment isolation valves from various plant systems into a consolidated review is appropriate 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 are descriptions of systems not described elsewhere that support integrity of the penetrations.

Primary Containment

For the purposes of this review, the primary containment penetrations include the drywell wall penetrations and the concrete containment cylinder wall penetrations.

As described in UFSAR Chapter 1, Section 1.2.2.4.9.1, the primary containment pressure suppression concept is a GE Mark III design. This containment design incorporates the drywell/ pressure suppression feature of previous BWR containment designs into a dry containment type of structure. In fulfilling its design basis as a fission product barrier in case of an accident, the Mark III containment is a low-leakage structure even at the elevated pressures that could follow a main steam line rupture or a recirculation line break. The main features of the design include the following:

a. A drywell surrounding the reactor vessel and a large part of the reactor coolant pressure boundary.

b. A suppression pool that serves as a heat sink during normal operational transients and accident conditions.

c. A containment upper pool for shielding, refueling operations, and makeup to the suppression pool.

d. A steel-lined reinforced concrete containment structure.

Secondary Containment

As described in UFSAR Section 6.2.3, the secondary containment consists of the auxiliary building and the enclosure building. The auxiliary building is a reinforced concrete structure which completely surrounds the lower portion of the primary containment, and the enclosure building is a metal-siding structure which completely surrounds the containment above the auxiliary building roofline. The fuel handling area and the auxiliary building ventilation systems maintain the secondary containment at a slightly negative pressure during normal operation. The SGTS also maintains the secondary containment at a negative pressure and provides cleanup of the potentially contaminated secondary containment volume following a design basis accident.

The primary and secondary containments contain penetrations that provide openings for equipment or personnel to pass through the containment boundaries and still maintain containment integrity. It is these penetrations and any associated isolation valves that are included in this review.

The containment penetrations perform the following intended function for 10 CFR 54.4(a)(1).

- Support containment integrity.

The containment penetrations 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 containment penetrations perform 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)

Drywell Monitoring

The purpose of the drywell monitoring system (system code D23) is to activate annunciators when the airborne particulate, iodine, or gaseous activity exceeds predetermined values. The drywell monitoring system includes a pump to draw a continuous sample of the drywell atmosphere through a particulate monitor, iodine monitor and gaseous monitor and return it to the drywell.

The drywell monitoring system includes piping and valves that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function.

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

- Support containment pressure boundary.

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

Containment and Drywell Instrumentation and Control

The purpose of the containment and drywell instrumentation and control (CDIC) system (system code M71) is to provide operator information for normal, upset and accident conditions as well as accident mitigation system performance information. Instrumentation is provided for the primary containment, drywell and suppression pool.

The CDIC system consists primarily of EIC components. Mechanical components in this system include piping and valves supporting safety-related pressure instrumentation in the drywell and containment. The piping and valves support the containment pressure boundary.

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

- Support safety-related pressure instrumentation in the drywell and containment.
- Support containment pressure boundary.

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

UFSAR References

Section 1.2.2.4.9.1	Section 9.2.3	Section 9.4.7
Section 5.4.1	Section 9.2.4	Section 9.4.8
Section 6.2.1.1.3.3.1.1	Section 9.5.9	Section 11.2
Section 6.5.3.1	Section 9.2.11	Figure 7.7-10
Section 7.1.2.1.4.5	Section 9.3.6	Table 6.2-44
Section 7.7.1.6	Section 9.4.6	Table 6.2-49

Drywell Monitoring

Section 7.6.1.4.3.9

Section 12.3.4.2

CDIC

Section 7.5.1

Components Subject to Aging Management Review

The structural portions of the containment penetrations (penetration pipe sleeves) are included in the review discussed in Section 2.4.1, Containment Building (including construction and spare penetrations). The internals of electrical penetration assemblies are included in the review discussed in Section 2.5, Scoping and Screening Results: Electrical and Instrumentation and Control Systems.

Mechanical components associated with containment penetrations in systems with their own aging management reviews are reviewed with their respective systems.

CDIC components that support containment pressure boundary and the safety-related pressure instrumentation are reviewed as listed below.

Containment penetrations not included in other system aging management reviews are reviewed as listed below.

Table 2.3.2-7 lists the component types that require aging management review.

Table 3.2.2-7 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-M-0033B	LRA-M-1079	LRA-M-1089
LRA-M-0034B	LRA-M-1080B	LRA-M-1099
LRA-M-1069D	LRA-M-1083B	LRA-M-1110A
LRA-M-1072B	LRA-M-1085A	LRA-M-1111A
LRA-M-1078C	LRA-M-1088C	
LRA-M-1078D	LRA-M-1088E	

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

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

Functional Failure

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

Physical Failure

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 GGNS, certain components and piping outside the safety class pressure boundary must be structurally sound in order 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 this review. 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.

- Section 2.3.2.1, Residual Heat Removal (E12)
- Section 2.3.2.2, Low Pressure Core Spray (E21)
- Section 2.3.2.3, High Pressure Core Spray (E22)
- Section 2.3.2.4, Reactor Core Isolation Cooling (E51)

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).

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 in order to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

Series 2.3.2-8-xx 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 3.2.2-8-xx 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
E12	RHR	Table 2.3.2-8-1	Table 3.2.2-8-1
E21	LPCS	Table 2.3.2-8-2	Table 3.2.2-8-2
E22	HPCS	Table 2.3.2-8-3	Table 3.2.2-8-3
E51	RCIC	Table 2.3.2-8-4	Table 3.2.2-8-4

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	
E12	RHR	LRA-M-1085A LRA-M-1085B	LRA-M-1085C LRA-M-1085D
E21	LPCS	LRA-M-1087	
E22	HPCS	LRA-M-1086	
E51	RCIC	LRA-M-1083A LRA-M-1083B	

Table 2.3.2-1
Residual Heat Removal System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Expansion joint	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Nozzle	Flow control
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Suction barrel	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-2
Low Pressure Core Spray System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Expansion joint	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Suction barrel	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-3
High Pressure Core Spray System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Expansion joint	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Suction barrel	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-4
Reactor Core Isolation Cooling System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Cyclone separator	Pressure boundary Filtration
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Flange	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
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
Pump casing	Pressure boundary
Sight glass	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Turbine casing	Pressure boundary
Valve body	Pressure boundary

**Table 2.3.2-5
Pressure Relief System
Components Subject to Aging Management Review**

Component Type	Intended Function
Bolting	Pressure boundary
Piping	Pressure boundary
Quencher	Pressure boundary Flow control
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-6
Standby Gas Treatment System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Filter unit housing	Pressure boundary
Moisture separator	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-7
Containment Penetrations
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.2-8-1
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
Coil	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.

Table 2.3.2-8-2
Low Pressure Core Spray 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
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 2.3.2-8-3
High Pressure Core Spray 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
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 2.3.2-8-4
Reactor Core Isolation Cooling 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
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.

2.3.3 Auxiliary Systems

The following systems are described in this section.

- Section 2.3.3.1, Control Rod Drive
- Section 2.3.3.2, Standby Liquid Control
- Section 2.3.3.3, Suppression Pool Makeup
- Section 2.3.3.4, Leakage Detection and Control
- Section 2.3.3.5, Combustible Gas Control
- Section 2.3.3.6, Fuel Pool Cooling and Cleanup
- Section 2.3.3.7, Standby Service Water
- Section 2.3.3.8, Component Cooling Water
- Section 2.3.3.9, Plant Service Water
- Section 2.3.3.10, Floor and Equipment Drainage
- Section 2.3.3.11, Compressed Air
- Section 2.3.3.12, Fire Protection – Water
- Section 2.3.3.13, Fire Protection – Halon and CO_2
- Section 2.3.3.14, Plant Chilled Water
- Section 2.3.3.15, Standby Diesel Generator
- Section 2.3.3.16, HPCS Diesel Generator
- Section 2.3.3.17, Control Room Heating, Ventilation and Air Conditioning
- Section 2.3.3.18, Heating, Ventilation and Air Conditioning
- Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

2.3.3.1 Control Rod Drive

System Description

The purpose of the control rod drive (CRD) system (system code C11) is to provide reactivity control by positioning the control rods to control power generation in the core. The control rod drive system is designed to insert the control rods, when required, with sufficient speed such that no fuel damage results from any abnormal operating transient. The control rod drive system includes the control rod drive mechanisms, which are part of the reactor system (system code B13), and the components, piping and valves of the control rod drive hydraulic system (system code C11).

The CRD mechanism (drive) used for positioning the control rod in the reactor core is a double-acting, mechanically latched, hydraulic cylinder using water as its operating fluid. The individual drives are mounted on the bottom head of the reactor pressure vessel. The CRD housings are welded into the reactor vessel with their lower end terminating in a flange below the vessel to which the drive is bolted. The control rod drive hydraulic system hydraulically operates the CRD mechanisms. The CRD mechanisms operate manually to position the control rods but act automatically or manually to rapidly insert the control rods (scram) during abnormal conditions requiring rapid shutdown.

The CRD hydraulic system supplies and controls the pressure and flow to and from the drives through hydraulic control units (HCU). One supply pump pressurizes the system with water from the condensate treatment system and/or condensate storage tanks. One spare pump is provided for standby. Each HCU controls the water flow to and from its associated drive during normal operation and reactor scram. The water discharged from the drives during a scram flows through the HCUs to the scram discharge volume. The water discharged from a drive during a normal control rod positioning operation flows through the HCU, the exhaust header, and is returned to the reactor vessel via the HCUs of the nonmoving drives.

The scram accumulator, part of each HCU, stores sufficient energy to fully insert a control rod at any vessel pressure. The accumulator is a hydraulic cylinder with a free-floating piston. The piston separates the water on top from the nitrogen below. A check valve in the accumulator charging line prevents loss of water pressure in the event supply pressure is lost.

The scram discharge volume consists of header piping which connects to each HCU and drains into an instrument volume. The header piping is sized to receive and contain all the water discharged by the drives during a scram.

The alternate rod insertion (ARI) system consists of three parallel vent paths from the scram pilot air header. Each vent path consists of two solenoid valves in series. Redundant ARI scram initiation trip systems open the solenoid valves to depressurize the scram pilot air header which actuates the CRD scram valves, independent of the reactor protection system. Each ARI scram initiation trip system is tripped on conditions indicative of an ATWS event.

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

- Insert all control rods into the core to quickly shut down the reactor in response to a manual or automatic signal.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The CRD 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 CRD 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 anticipated transient without scram (ATWS) (10 CFR 50.62) (ARI function).

UFSAR References

Section 4.6.1.1

Components Subject to Aging Management Review

The control rod drive mechanisms (part of system B13) are Class 1 components supporting the reactor coolant pressure boundary and are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining CRD components (non-Class 1 safety-related piping and components in the CRD system code including the HCUs and piping and components to and from the control rod drives; scram discharge headers and associated piping) are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-1081A

LRA-M-1081B

LRA-M-1051A

2.3.3.2 Standby Liquid Control

System Description

The purpose of the standby liquid control (SLC) system (system code C41) is to provide a redundant, independent, and alternate way to bring the nuclear fission reaction to subcriticality and to maintain subcriticality as the reactor cools without taking credit for control rod movement. The SLC system injects borated water into the reactor core to bring the reactor, at any time in a fuel cycle, from full power and minimum control rod inventory to a subcritical condition. The SLC system is manually initiated from the main control room if the reactor cannot be shut down, or kept shut down, with the control rods.

The SLC system consists of a boron solution storage tank, two positive displacement pumps, two explosive actuated valves which are provided in parallel for redundancy, and associated piping and valves used to transfer borated water from the storage tank to the reactor vessel. The borated solution (sodium pentaborate) is discharged through the high pressure core spray system sparger.

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

- Provide the capability of bringing the reactor from full power operation to cold subcritical, without control rod movement, by mixing a neutron absorber with the primary reactor coolant.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The SLC 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 SLC 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 anticipated transient without scram (ATWS) (10 CFR 50.62).

UFSAR References

Section 6.2.4.3.1.1.6

Section 9.3.5.2

Components Subject to Aging Management Review

ASME Class 1 components with the intended function of maintaining the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining SLC system 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 drawing.

LRA-M-1082

2.3.3.3 Suppression Pool Makeup

System Description

The purpose of the suppression pool make-up (SPMU) system (system code E30) is to transfer water from the upper containment pool to the suppression pool by gravity flow following a LOCA. For a LOCA with emergency core cooling system injection from the suppression pool, a large volume of water can be held up in the drywell behind the weir wall. This holdup can significantly lower suppression pool water level. The water transfer from the SPMU system ensures the suppression pool top row vents are adequately covered so that post-LOCA long-term steam condensation is maintained. The additional makeup water is used as part of the long-term suppression pool heat sink.

The SPMU system consists of two redundant subsystems, each capable of dumping the makeup volume from the upper containment pool to the suppression pool by gravity flow. The piping system consists of two lines which penetrate the separator end of the upper containment pool through the side walls. One line is on either side of the separator pool and then routed down to the suppression pool on opposite sides of the steam tunnel. Each suppression pool makeup line has two normally closed motor-operated butterfly valves in series. The upper pool is dumped by gravity flow after opening the two normally closed valves in series in each line. The system also supports safety-related suppression pool level instrumentation used for suppression pool makeup control and other safety systems.

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

- Transfer water from the upper containment pool to the suppression pool by gravity flow following a LOCA.
- Support safety-related suppression pool level instrumentation.
- Support containment pressure boundary.

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

UFSAR References

Section 6.2.7

Components Subject to Aging Management Review

SPMU system components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-1096	LRA-M-1087
LRA-M-1085C	LRA-M-1069D

2.3.3.4 Leakage Detection and Control

System Description

The following three systems are included in this review and comprise the leakage detection and control system:

- Leak Detection System (E31).
- Main Steam Isolation Valve Leakage Control System (E32).
- Feedwater Leakage Control System (E38).

Leak Detection System

The purpose of the leak detection system (system code E31) is to detect, annunciate, and isolate (in certain cases) leakages in systems that are part of or connected to the reactor coolant pressure boundary or the fuel pool cooling system. The leak detection system consists of temperature, pressure, radiation, flow, and level sensors with associated instrumentation and alarms. This system detects and annunciates leakage in the following:

- Main steam lines
- Reactor water cleanup (RWCU) system
- Residual heat removal (RHR) system
- Reactor core isolation cooling (RCIC) system
- Fuel pool cooling and cleanup (FPCC) system
- High pressure core spray (HPCS) system
- Low pressure core spray (LPCS) system
- Reactor recirculation system
- Coolant systems within the drywell
- Instrument lines

Small leaks generally are detected by temperature and pressure changes and the rate of fill of drain sumps. Large leaks are also detected by changes in flow rates in process lines. Leaks within the drywell are detected by monitoring for abnormally high pressure and temperature within the drywell, high levels and fill-up rates and long pump-out times of equipment and floor drain sumps, and increased flow rate of the drywell cooler condensate. Temperatures within the drywell are monitored at various elevations. Outside the drywell, leakage may be detected by area temperature indications or flow monitoring instruments. Leakage from the fuel pool is collected by a leak chase system and drained to the leak detection system.

The leak detection system is comprised primarily of EIC components. However, mechanical components, such as standpipes, piping, valves and flow glasses, are included in the pressure, flow and level dependent portions of the leak detection subsystems. Leak detection system components form part of the pressure boundary of the monitored systems and also support the containment pressure boundary. Other than these pressure boundary functions and leak detection for the fuel pool, the mechanical subsystems have no safety functions.

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

- Monitor leakage from the fuel pool.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

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

Main Steam Isolation Valve Leakage Control System

The purpose of the main steam line isolation valve leakage control system (MSIV-LCS) (system code E32) is to minimize the release of fission products which could bypass the standby gas treatment system after a LOCA. This is accomplished by directing the leakage through the closed main steam line isolation valves to a space serviced by the standby gas treatment system (SGTS).

The MSIV-LCS consists of two independent subsystems: an inboard subsystem, which is connected between the inboard and outboard MSIVs, and an outboard subsystem, which is connected immediately downstream of the outboard MSIVs. Each subsystem is capable of processing leakage from MSIVs following a design basis accident (DBA) LOCA. Each subsystem consists of valves and piping. The outboard subsystem includes two blowers.

The MSIV-LCS directs leakage through the closed main steam isolation valves to the outboard subsystem bleed lines, which pass the leakage flow into an area served by the standby gas treatment system. The flow is produced by a blower that maintains the pressure in the steam lines slightly negative with respect to atmosphere, thus assuring that the MSIV leakage will pass through the blower and on into the area served by the standby gas treatment system prior to release to the atmosphere. The single leakage path per steam line of the inboard subsystem performs the same function.

The MSIV-LCS has the following intended functions for 10 CFR 54.4(a)(1).

- Direct leakage through the closed main steam line isolation valves to a space serviced by the standby gas treatment system.

- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The MSIV-LCS 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 MSIV-LCS has no intended functions for 10 CFR 54.4(a) (3).

Feedwater Leakage Control System

The purpose of the feedwater leakage control system (FW-LCS) (system code E38) is to minimize the fission products which could bypass the SGTS after a LOCA. This is accomplished by filling the feedwater lines between the containment isolation valves with suppression pool water and maintaining a water seal at a pressure slightly higher than the containment pressure.

The FW-LCS consists of two independent, manually initiated subsystems, either of which is capable of preventing fission product leakage from the containment post-LOCA. Each subsystem uses an RHR jockey pump and a header which provides sealing water to pressurize the feedwater piping either between the inboard and outboard containment isolation check valves or between the outboard containment isolation check valve and an additional outboard motor operated gate valve. System components supplying the feedwater piping between the inboard and outboard containment isolation check valves are part of the reactor coolant pressure boundary.

The FW-LCS has the following intended functions for 10 CFR 54.4(a)(1).

- Establish and maintain a water seal between the containment isolation valves of the feedwater lines at a pressure slightly higher than the containment pressure, following a LOCA.
- Maintain integrity of reactor coolant pressure boundary.
- Support containment pressure boundary.

The FW-LCS has no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

UFSAR References

Leak Detection System	*MSIV-LCS*	*FW-LCS*
Section 5.2.5	Section 6.7.1	Section 6.7.2
Section 7.6.1.4		
Section 9.1.2.3.2		

Components Subject to Aging Management Review

Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. A small number of leak detection system components are evaluated in Section 2.3.3.6, Fuel Pool Cooling and Cleanup. Nonsafety-related components of the leak detection system and the MSIV-LCS systems whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining components of the leak detection system, MSIV-LCS and FW-LCS are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-1077A	LRA-M-1090A
LRA-M-1079	LRA-M-1090B
LRA-M-1083B	LRA-M-1097
	LRA-M-1112

2.3.3.5 Combustible Gas Control

System Description

The purpose of the combustible gas control system (CGCS) (system code E61) is to control the concentration of hydrogen which may be released in the drywell and containment following a postulated LOCA. The three CGCS subsystems that provide hydrogen concentration control are the drywell purge system, the hydrogen control system consisting of a hydrogen recombiner system and a hydrogen ignition system, and the backup containment purge system. The hydrogen ignition system is used to control the excessive quantity of hydrogen generated during the very unlikely occurrence of a degraded core accident. The drywell purge compressors also dilute post-LOCA drywell radionuclide concentrations with the containment and suppression pool atmospheres by pressurizing the drywell and discharging the drywell atmosphere through the drywell suppression pool vents.

The CGCS also includes components of other related subsystems. The normal drywell vacuum relief line, post-LOCA drywell vacuum relief lines, drywell purge vacuum relief lines, and the hydrogen analyzer subsystems are part of the CGCS system code.

Drywell Purge

The drywell purge system is provided to dilute post-LOCA drywell radionuclide concentrations with the containment and suppression pool atmospheres. The system also purges the hydrogen produced within the drywell into the larger containment volume. The system consists of redundant trains, each consisting of one compressor, two isolation valves (one check and one motor-operated butterfly), and the required instrumentation. The system draws from the containment volume and discharges into the drywell. The continued operation of the compressors causes flow of the drywell atmosphere through the horizontal vent system and into the containment via the suppression pool. As described in the safety evaluation for Technical Specification Amendment 166, the purging of hydrogen from the drywell is no longer a required safety function.

Hydrogen Control

Hydrogen Recombiner

The hydrogen recombiner system is fully redundant and consists of two 100-percent capacity hydrogen recombiners. Containment atmosphere is heated within the recombiner in a vertical duct causing it to rise by natural convection. As it rises, replacement air is drawn through intake louvers downward through a preheater section which will temper the air and lower its relative humidity. The preheated air then flows through an orifice plate to the heater section. The air flow is heated to a temperature above the hydrogen-oxygen reaction temperature to form water vapor. After passing through the heater section, the flow enters a mixing section, which is a louvered chamber where the hot gases are mixed and are discharged directly into the containment. As described in the safety evaluation for Technical Specification Amendment 166, the recombination of hydrogen and oxygen is no longer a required safety function. However, Entergy has conservatively chosen to maintain the hydrogen recombiners as safety-related equipment.

Hydrogen Ignition

The hydrogen ignition system is a system of igniters installed within the containment. This system is required to function only in the unlikely event that large quantities of hydrogen are generated as a result of a postulated, severely degraded core accident. The hydrogen ignition system consists of 90 igniter assemblies distributed throughout the containment and drywell. The igniter assemblies are glow plugs partially enclosed in a stainless steel box which houses the transformer and the associated electrical connections. The sealed box uses a hooded spray shield to reduce water impingement on the glow plug where required.

Containment Purge

The redundant drywell purging and hydrogen control systems ensure control of the post-accident hydrogen concentration. For conservatism, the containment hydrogen purge system is provided. The containment is purged through the containment filtration system charcoal filter trains. The containment purge system takes outside air as make up through a compressor into the containment. The purge is through an electric heater, a prefilter, a charcoal filter, and a high efficiency particulate air (HEPA) filter to reduce the activity released. Except for those portions of the purge system which constitute the containment boundary, this system is nonsafety-related.

Drywell Vacuum Relief

Following either a postulated large or small break LOCA, drywell vacuum relief is provided by two drywell post-LOCA and two drywell purge vacuum relief subsystems. This vacuum relief, using flow paths from containment into the drywell, is provided to prevent backflow over the weir wall following a postulated small break LOCA. In addition, it serves to control rapid weir wall overflow following a large break LOCA. An independent vacuum relief capability (normal drywell vacuum relief line) is provided by a separate system for normal operating transients.

Containment and Drywell Hydrogen Monitoring

Two containment hydrogen concentration and two drywell hydrogen concentration signals are transmitted from four separate hydrogen analyzers. Each hydrogen analyzer uses a sample drawing system which removes the sample from the containment or drywell, as appropriate. The sample drawing points are located at widely separated and appropriately placed points inside the containment and drywell. As described in the safety evaluation for Technical Specification Amendment 166, monitoring of hydrogen concentration is no longer a required safety function. However, Entergy has conservatively chosen to maintain the hydrogen analyzers as safety-related equipment.

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

- Control the concentration of hydrogen released in the drywell and containment following a LOCA.
- Dilute the drywell atmosphere with containment air and purge the drywell atmosphere into the containment.
- Induce the controlled combustion of hydrogen in containment.
- Provide drywell vacuum relief protection relative to the containment.
- Support containment pressure boundary.

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

UFSAR References

Section 6.2.5

Section 7.5.1.2.8.3

Components Subject to Aging Management Review

Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Most components of the CGCS, including the hydrogen recombiners and hydrogen analyzers which no longer have a safety function, are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-1091	LRA-M-1061D
LRA-M-1061B	LRA-M-1100B

2.3.3.6 Fuel Pool Cooling and Cleanup

System Description

This review includes the fuel pool cooling and cleanup (FPCC) system (system codes G41, G46) and the servicing equipment system codes (F11 through F17), which include the Boraflex neutron absorber panels in the fuel storage racks and the tools and equipment used primarily during refueling outages.

Fuel Pool Cooling and Cleanup

The purpose of the FPCC system (system codes G41, G46) is to maintain acceptable temperature, clarity, and radioactivity levels of the water in the upper containment, fuel storage, and cask pools. During normal plant operation, the FPCC system transfers decay heat released to the spent fuel pool to the component cooling water (CCW) system via the FPCC heat exchanger(s). FPCC heat exchangers use CCW during normal operation; however, essential cooling water for accident conditions is provided by the standby service water (SSW) system.

Water overflows from the pool into skimmers or scuppers around the periphery of the pools and is collected in the fuel pool drain tank. Water is normally routed through at least one heat exchanger and one filter-demineralizer circuit before returning to the pool. Spent fuel pool water is normally circulated by means of one of two parallel pumps.

Clarity and purity of the pool water are maintained by a combination of filtering and ion exchange. The filter demineralizers maintain water chemistry for compatibility with the Unit 1 stainless steel fuel storage racks.

The FPCC system includes two system codes. The fuel pool cooling and cleanup system (G41) includes the safety-related fuel pool pumps, heat exchangers, collection and distribution piping and valves. The filter/demineralizer system (G46) includes the nonsafety-related filter/demineralizers and regeneration equipment. Both system codes include piping and valves supporting containment pressure boundary.

Makeup water during normal operation is supplied from the condensate and refueling water storage and transfer system. Emergency makeup water is available from standby service water system or the suppression pool water through the RHR system.

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

- Remove the decay heat from spent fuel assemblies.
- Monitor fuel pool water level and maintain a water level above the fuel sufficient to provide radiation shielding.
- Support containment pressure boundary.

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

Servicing Equipment

The servicing equipment system codes include tools and equipment used primarily during refueling outages. Servicing equipment is included in the following system codes:

- Fuel servicing equipment (F11) and refueling equipment (F15) include tools and equipment used to handle and service fuel, such as the new fuel inspection stand, channel gauging fixture, fuel pool sipper, fuel handling platforms, new fuel bridge crane and horizontal fuel transfer tube system.

- Servicing aids (F12) includes underwater equipment such as the underwater lights and TV system, underwater vacuum cleaner, underwater viewing aids and actuating poles.

- Reactor vessel servicing equipment (F13) includes tools and equipment used to handle and access vessel components, such as the containment polar crane main hoist, drywell head lifting frame, dryer and separator strongback, and head holding pedestals.

- In-vessel servicing equipment (F14) includes tools and equipment used inside the vessel, such as the control rod guide tube grapple, the instrument handling tool, incore guide tube seal and jet pump plug.

- Storage equipment (F16) includes storage racks for new and spent fuel, control rods and other equipment. The cell walls of the high density spent fuel storage racks incorporate a neutron absorber (Boraflex) sandwiched between sheets of stainless steel for criticality control. This system code also includes spent fuel dry cask storage equipment, which is not evaluated for license renewal.

- Under reactor vessel servicing equipment (F17) includes tools and equipment used under the vessel, such as control rod drive service tools and the incore flange seal test plug.

The review of the Boraflex neutron absorber panels is included in this review of the FPCC system. The servicing equipment system codes contain no other mechanical components with an intended function. Other servicing equipment structural components, such as the storage racks, fuel handling bridges and the containment polar crane are included in the structural evaluations.

The servicing equipment systems have the following intended function for 10 CFR 54.4(a)(1).

- Provide criticality protection. This function is performed by Boraflex plates in the pool racks.

The servicing equipment systems have no intended functions for 10 CFR 54.4(a)(2) or (a)(3).

UFSAR References

Section 9.1.2.3.2

Section 9.1.3

Components Subject to Aging Management Review

Components of the filter/demineralizer system that support the containment pressure boundary are reviewed in Section 2.3.2.7, Containment Penetrations. A small number of components that form part of the component cooling water system pressure boundary are reviewed in Section 2.3.3.8, Component Cooling Water. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining components are reviewed as listed below.

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

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

License Renewal Drawings

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

LRA-M-1085A	LRA-M-1088D
LRA-M-1085B	LRA-M-1088E
LRA-M-1087	LRA-M-1090A
LRA-M-1088C	LRA-M-1090B

2.3.3.7 Standby Service Water

System Description

The purpose of the standby service water (SSW) system (system code P41), is to remove heat from equipment required for a safe reactor shutdown. The SSW system dissipates that heat to the environment through the ultimate heat sink (UHS), which is part of the system. The SSW system provides cooling water for the removal of heat from unit auxiliaries, such as RHR system heat exchangers, standby diesel generators (DGs), HPCS diesel generator, and room coolers for emergency core cooling system equipment required for a safe reactor shutdown following a design basis accident or transient. The SSW system also provides cooling to unit components, as required, during normal shutdown and reactor isolation modes. During a DBA, the equipment required only for normal operation is isolated from the SSW system, and cooling is directed only to safety-related equipment.

The SSW system consists of redundant cooling water trains comprised of cooling towers, pumps, piping, valves, and instrumentation. Cooling water is pumped from the cooling tower basins by two SSW pumps and one HPCS service water pump to the essential components through the two main redundant SSW supply headers (loops A and B) and the HPCS service water supply header (loop C). After removing heat from the components, the coolant is returned to the cooling towers (UHS), where the heat is rejected to the environment through direct contact with ambient air.

The UHS consists of two cooling towers with two required fan cells per tower, each with a concrete makeup water cooling tower basin. These two cooling tower basins are interconnected by a siphon line (to transfer water between them) and together constitute the UHS basin. The combined UHS basin volume is sized such that sufficient water inventory is available for all SSW system post-LOCA cooling requirements with no external makeup water source available. Normal makeup for each cooling tower basin is provided automatically by the plant service water system.

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

- Supply cooling water to safety-related systems and components during plant shutdown, reactor isolation, refueling and post-accident conditions.
- Transfer heat from safety-related loads to the environment.
- Support containment pressure boundary.

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

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

UFSAR References

Section 9.2.1

Components Subject to Aging Management Review

A small number of components at the system interfaces with the component cooling water and plant service water systems are reviewed in Section 2.3.3.8, Component Cooling Water, and Section 2.3.3.9, Plant Service Water, respectively. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining 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-M-1061A	LRA-M-1063A
LRA-M-1061B	LRA-M-1072A
LRA-M-1061C	LRA-M-1072F
LRA-M-1061D	LRA-M-1107G

2.3.3.8 Component Cooling Water

System Description

The purpose of the component cooling water (CCW) system (system code P42) is to cool auxiliary plant equipment during normal operating and normal shutdown conditions. Cooling water will also be provided for some components during a loss of offsite power. The CCW system provides a closed cooling water loop between certain systems that are potentially radioactive and the plant service water used for cooling.

The CCW system is a closed-loop system that provides parallel-flow cooling to auxiliary equipment in the containment, drywell, auxiliary buildings and turbine building. The CCW system provides cooling to the reactor recirculation pump seals, motor bearings and coolers; reactor water cleanup pump coolers and non-regenerative heat exchangers; post-accident sample coolers; drywell equipment drain sump cooler; alternate decay heat removal sample cooler; CRD pump coolers; and fuel pool heat exchangers. The system consists of three half-capacity pumps and heat exchangers, tanks, piping, valves, and instrumentation. Heat is removed from the CCW system by the plant service water system during normal operation. The service water is passed through the tube side of the CCW heat exchangers, and the closed-loop water is passed through the shell side.

In the event of a loss of offsite power, the reactor water cleanup and fuel pool heat exchangers will be automatically isolated from the rest of the CCW system. One of the CCW pumps will operate to continue cooling the remaining system components. The operating CCW pump is powered from an engineered safety features bus. An intertie between the plant service water system and the SSW system is provided to automatically supply cooling water to the CCW heat exchangers. In addition, each fuel pool heat exchanger is provided with an independent intertie connection to and from the SSW system to supply emergency cooling water to these components.

Piping and valves associated with fuel pool heat exchangers, (forming part of the standby service water pressure boundary when cooling the fuel pool heat exchangers) and piping and valves forming a part of containment boundary are safety-related. The remaining system has no safety function and is not required for a safe shutdown of the reactor.

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

- Maintain integrity of the standby service water system pressure boundary.
- Support containment pressure boundary.

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

UFSAR References

Section 9.2.2

Components Subject to Aging Management Review

Some heat exchanger components are reviewed in Section 2.3.3.9, Plant Service Water. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining CCW system 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-M-1063A

LRA-M-1063B

2.3.3.9 Plant Service Water

System Description

The purpose of the plant service water (PSW) system (system code P44) is to cool plant auxiliary equipment over the full range of reactor operation during normal operating and normal shutdown conditions. The system is designed to cool plant auxiliaries that are not required for safe reactor shutdown and are not potential sources of radioactive contamination during normal operation. The plant service water system provides the cooling for various systems including the component cooling water and turbine building cooling water heat exchangers, plant chillers, drywell chillers, mechanical vacuum pump water jacket coolers, ESF electrical switchgear room coolers, control room air conditioners, steam jet air ejectors intercondensers, a containment leak rate test system compressor aftercooler, and alternate decay heat removal heat exchangers and air conditioner. The PSW system also provides makeup to the circulating water system and the water treatment system. The system distributes water from the radial well system through the various heat exchangers, chillers and coolers, and discharges to the circulating water system.

For the control room air conditioner and ESF electrical switchgear room coolers, an intertie with the SSW system has been included to provide cooling during an emergency shutdown when plant service water is not available. For the component cooling water heat exchangers and two drywell chillers, an intertie with the standby service water system has been provided to provide cooling during a non-emergency loss of offsite power condition.

PSW piping serving the alternate decay heat removal subsystem (ADHRS), including the manual isolation valves at the common supply and return lines from the PSW header, and isolation valves at the ADHRS room cooler, are designated as safety-related, because the components were originally intended to support a proposed ADHRS safety function. However, the ADHRS function was determined to be nonsafety-related, so there are no established requirements for this conservative designation. This isolated portion of the PSW system contains only piping and valves that, by themselves, can provide nothing other than a pressure boundary function. This pressure boundary is not required to maintain the reactor coolant pressure boundary, is not required to achieve or maintain safe shutdown and is not credited to prevent or mitigate accidents with significant dose consequences. Consequently, these components have no safety function with respect to the ADHRS.

Portions of the PSW system that interface with the standby service water system are classified as safety-related if the failure of these interfaces would affect the operation of the SSW system. The PSW system also includes pressure boundary components for the penetrations in the primary and secondary containments. PSW piping and components inside the auxiliary building form a closed system which provides the secondary containment pressure boundary for this system. The safety-related penetration components and nonsafety-related components of the closed system support the containment pressure boundary. With the exception of the containment pressure boundary support function and support for the SSW system pressure boundary, the PSW system has no safety function.

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

- Maintain integrity of standby service water system pressure boundary.
- Support containment pressure boundary.

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

- Support containment 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 PSW system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 9.2.8

Components Subject to Aging Management Review

Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining PSW 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-M-1072A	LRA-M-1061B	LRA-M-1103A
LRA-M-1072E	LRA-M-1061C	LRA-M-1107H
LRA-M-1072F	LRA-M-1063A	LRA-M-1109A
LRA-M-1072H		

2.3.3.10 Floor and Equipment Drainage

System Description

The purpose of the floor and equipment drainage (FED) system (system codes P45, P46, P48) is to collect liquid waste throughout the plant and discharge the radioactive and potentially radioactive waste to the radwaste system for processing. Separate drainage facilities are provided for nonradioactive waste. The drainage system is also used to detect abnormal leakage in the emergency safety features rooms, the drywell, and containment.

The FED system is designed to assure that waste liquids, valve and pump leakoffs, and tank drains are directed to the proper area for processing or disposal. The process portion of the system consists of sump pumps, sump cooler, tanks, pumps, valves, and instrumentation. The collection portion of this system consists of collection piping, equipment drains, floor drains, vents, traps (in nonradioactive systems only), cleanouts and tanks. The floor drains are credited for the removal of water from various areas of the plant to prevent or minimize flooding due to the rupture of plant piping.

The FED system includes three system codes. System code P45 encompasses most floor and equipment drainage system components. The P46 and P48 system codes include a limited number of components of the suspended drainage piping portion of the FED system.

The FED system includes piping and valves that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function.

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

- Support containment pressure boundary.

The FED 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.
- Provide flood protection for safety-related components.

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

UFSAR References

Section 9.3.3

Components Subject to Aging Management Review

Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining system components are reviewed as listed below.

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

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

License Renewal Drawings

Some floor drain flow paths from the floor drains to the sumps are shown only on plant layout and equipment drawings which are not suitable for LRA drawings. In lieu of LRA drawings, the floor drain routing, describing floor drain flow paths included in this review, is provided in the table below.

Route Number	Description
1	Drainage flows from the Division II Switchgear Area located on 133' elevation in the Control Building to Area 25A floor drain sump. These drains provide adequate drainage support in an event of internal flooding to support the safety-related equipment in the Division II Switchgear room.
2	Drainage flows from Area 25B located on 133 'elevation to Area 25A floor drain sump in the Control Building. These drains provide adequate drainage support in an event of internal flooding to support the safety-related equipment in Area 25B on the 133' elevation in the Control Building.
3	Drainage flows from Area 25A and 25B located on the 189’ elevation to the storm drain system. These drains provide adequate drainage support in an event of internal flooding to support the safety-related equipment in Area 25A and 25B on the 189’ elevation in the Control Building.

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

LRA-M-1094A	LRA-M-1098A
LRA-M-1094B	LRA-M-1098B
LRA-M-1094C	LRA-M-1098F
LRA-M-1094E	LRA-M-1098G

2.3.3.11 Compressed Air

System Description

This review includes the three compressed air system codes and the hatches and locks system code.

Compressed Air Systems

The purpose of the compressed air systems is to provide a continuous supply of compressed air of suitable quality and pressure to air operated components throughout the plant and for general plant use. The compressed air systems include the plant compressed air (PCA) system (system code P51), the service air (SA) system (system code P52) and the instrument air (IA) system (system code P53).

The PCA system includes three multi-staged, packaged, rotary screw compressors, each with inlet filter, capacity control valve, intercooler, and aftercooler. The compressors supply four plant air receivers. The receivers supply air to the service air header and to the air dryers. The PCA system has two heated type desiccant air dryers that provide the primary means of drying air from the compressors for use in the instrument air system. These plant air dryers are not dedicated to a specific compressor, but are installed in a common output header from the plant air receivers. The dryers are located just upstream of the main instrument air header pressure control station.

The SA system includes distribution piping and valves to supply air for general purposes throughout the plant. The system includes piping and valves supporting the containment pressure boundary. With the exception of the containment pressure boundary function, the SA system has no safety function.

The IA system includes distribution piping and valves to supply instrument quality air throughout the plant. The system also includes two booster compressors that boost the instrument air pressure to the higher operating pressure of the automatic depressurization system (ADS) pneumatic supply.

The IA system includes pressure boundary components for the penetration in the secondary containment. IA system piping and components inside the auxiliary building form a closed system which provides the secondary containment pressure boundary for this system. The safety-related penetration components and nonsafety-related components of the closed system support the containment pressure boundary.

Instruments, controls, and services such as main steam isolation valves, main steam relief valves, and containment air locks are provided with air accumulators (part of the nuclear boiler system [system code B21, Section 2.3.1.3] or hatches and locks system [system code M23]) for reliable operation without compressor operation. Other pneumatic-operated devices are designed for the fail-safe mode and do not require continuous air supply under emergency or abnormal conditions.

With the exception of the containment pressure boundary functions, the compressed air systems have no safety function. Failure of these systems will not compromise any safety-related system or component and will not prevent safe reactor shutdown.

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

- Support containment pressure boundary.

The compressed air systems have 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 containment pressure boundary.

The compressed air systems have no intended functions for 10 CFR 54.4(a)(3).

Hatches and Locks

The hatches and locks system code (M23) includes the containment and drywell equipment hatches, the containment personnel airlocks and the drywell airlock. The purpose of the equipment hatches is to provide equipment access to the containment and drywell during outages. The purpose of the airlocks is to provide personnel access to the containment and drywell while also providing a continuous seal between the inside and outside of the containment or drywell.

Major components of the hatches and airlocks are structural components. The airlocks use inflatable seals to maintain the containment pressure boundary. The components used to inflate the airlock seals (air accumulators, piping and valves) are mechanical, while the seals themselves are considered structural components.

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

- Provide a reserve capacity of compressed air (accumulators) for those components requiring a supply of compressed air to provide engineered safety features and containment pressure boundary.
- Support containment pressure boundary.

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

UFSAR References

Section 9.3.1

Components Subject to Aging Management Review

Nonsafety-related compressed air components whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining components of system codes P51, P52, P53, and M23 and air accumulators from system code B21 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-M-1124A	LRA-M-1067A	LRA-M-1068A	LRA-M-1077A
LRA-M-1124B	LRA-M-1067D	LRA-M-1068C	LRA-M-1077C
LRA-M-1124C	LRA-M-1067E		LRA-M-1077D
LRA-M-1101	LRA-M-1067M		LRA-M-1077E

2.3.3.12 Fire Protection – Water

System Description

The purpose of the fire protection system (system code P64) is to provide an adequate supply of water or chemicals to points throughout the plant area where fire protection may be required. Diversified fire-alarm and fire-suppression methods are selected to suit the particular areas or hazards being protected. The fire protection system consists of fire water suppression subsystems, chemical fire fighting equipment (CO_2 and Halon 1301), portable fire extinguishers, portable breathing apparatus, and the instrumentation and controls for fire detection, alarm, and operation of the fire-fighting systems. The fire protection – water system is reviewed below. The Halon and CO_2 systems are reviewed in Section 2.3.3.13.

The fire protection – water system consists of an underground yard loop with two water storage tanks at atmospheric pressure, one electrically driven and two diesel-driven fire pumps, one jockey fire pump, fire water yard mains, hydrants, standpipes, hose stations, sprinklers, and deluge spray systems. The two water storage tanks are supplied by the plant service water system (Section 2.3.3.9, Plant Service Water). The fire pump suction piping is arranged so that any pump can take suction from either water storage tank.

The jockey fire pump replaces normal system leakage and maintains system pressure sufficiently high to preclude continuous or frequent operation of the main fire pumps. Three main fire pumps ensure the full required water flow with one pump out of service. In the event that a demand in excess of the jockey pump discharge capacity is placed on the fire water system, the main fire pumps will be started automatically as needed to maintain system pressure: first the electric motor-driven fire pump will start, followed by the diesel engine-driven fire pumps.

With the exception of a portion routed through the northeast corner of the Unit 2 turbine building, a cement-lined, cast iron, underground yard loop surrounds the entire power block. The yard loop provides water to hydrants, wet standpipes, hose stations, deluge spray systems, and sprinkler systems.

Two-way hydrants are provided on the yard main at approximately 250-foot intervals. Each fire hydrant is provided with an isolation valve in order to isolate the hydrant in the event of physical damage and/or mechanical malfunction. Provided for each hydrant is a hose house equipped with 250 feet of 2½-inch, lined fire hose, and two 2½-inch adjustable spray nozzles.

Wet-pipe sprinkler, dry-pipe sprinkler, pre-action sprinkler systems with fusible heads, and deluge spray systems with open spray nozzles are provided within the plant. Wet standpipe hose stations are located throughout the plant in strategic locations to ensure hose stream plant coverage and to serve as backup for fixed suppression systems.

The condensate and refueling water storage and transfer system supplies water to all of the fire suppression systems located inside containment. These fire suppression systems consist of two manually actuated containment cooling system charcoal filter train deluge systems and thirteen hose stations. The condensate and refueling water storage and transfer system includes the pressure boundary components for the penetration into primary containment. The fire protection system includes the pressure boundary components for the penetration into secondary containment. Fire protection piping and components inside the auxiliary building form a closed system which provides the secondary containment pressure boundary for this system. The safety-related and nonsafety-related components of this closed system support the containment pressure boundary.

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

- Support containment pressure boundary.

The fire protection – water system has the following intended functions for 10 CFR 54.4(a)(2).

- Support containment 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 fire protection – water system has the following intended function for 10 CFR 54.4(a)(3).

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

UFSAR References

Section 9.5.1.2

Appendix 9A

Components Subject to Aging Management Review

Nonsafety-related components whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining fire protection – water 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-M-0035A	LRA-M-0035K
LRA-M-0035B	LRA-M-0035L
LRA-M-0035G	LRA-M-0035R
LRA-M-0035H	

2.3.3.13 Fire Protection – Halon and CO_2

System Description

The purpose of the fire protection system (system code P64) is to provide an adequate supply of water or chemicals to points throughout the plant area where fire protection may be required. Diversified fire-alarm and fire-suppression methods are selected to suit the particular areas or hazards being protected. The fire protection system consists of fire water suppression subsystems, chemical fire fighting equipment (CO_2 and Halon 1301), portable fire extinguishers, portable breathing apparatus, and the instrumentation and controls for fire detection, alarm, and operation of the fire-fighting systems. The Halon and CO_2 systems are reviewed below. The fire protection – water system is reviewed in Section 2.3.3.12.

Manual carbon dioxide, automatic carbon dioxide, or automatic Halon 1301 total flooding gaseous extinguishing systems are provided where water is not a feasible fire-fighting agent due to the presence of electrical components that are not waterproof.

The manual carbon dioxide systems include rate-compensated temperature sensors which, upon sensing a high rate of temperature rise or a high ambient temperature, alarm locally and in the control room so that an operator is alerted to investigate and determine whether or not to activate the system. Rate-compensated heat detectors activate the automatic carbon dioxide systems and the automatic Halon 1301 systems. Where required to maintain concentrations, automatic controls close ventilation ductwork and doors, so that an adequate concentration of extinguishing agent is contained within the protected area. A carbon dioxide extinguishing system is designed to achieve a concentration of 50 volume percent. Carbon dioxide gas is stored in bulk quantity outdoors and is distributed to the turbine and auxiliary buildings. The safety-related and nonsafety-related valves and piping components of this system support the containment pressure boundary.

Halon 1301 for the computer room systems is stored in pressurized bottles located outside but adjacent to the room protected. Halon 1301 for the power generation control complex systems is stored in pressurized bottles located inside enclosures (part of system code H13) at the end of the control cabinets in the control room and the control cabinet area. The pressurized Halon 1301 bottles are provided with safety pressure-relief valves.

Portable fire extinguishers are strategically located throughout the plant. Portable fire extinguishers are selected for an area after an evaluation of the type of combustibles present, in order to properly match the type of extinguisher to the service required. Water extinguishers are strategically located for use in spaces which contain safe shutdown-related equipment.

Portable breathing apparatus and required appurtenances are available to the fire brigade. The breathing apparatus are used by the fire fighters when fighting fires in smoke-filled areas or in areas where a fire might cause substances to release dangerous gases and vapors.

The fire protection – Halon and CO_2 system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

The fire protection – Halon and CO_2 system has the following intended function for 10 CFR 54.4(a)(2).

- Support containment pressure boundary.

The fire protection – Halon and CO_2 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

Section 9.5.1.2

Appendix 9A

Components Subject to Aging Management Review

Portable extinguishers, fire hoses and air packs (self-contained breathing apparatus) are not subject to aging management review since they are replaced based on performance and condition monitoring.

Halon and CO_2 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-M-0035E

LRA-M-0035F

2.3.3.14 Plant Chilled Water

System Description

The purpose of the plant chilled water (PCW) system (system code P71) is to provide chilled water to the nonsafety-related turbine building, control building, radwaste building, auxiliary building, diesel generator building, and containment fan-coil units for space cooling and dehumidification. The plant chillers also supply cooling water for the sample coolers located throughout the plant and for the thrust bearing on the main circulating water pumps. Chilled water is produced by mechanical chilling units and supplied to area cooling units through closed recirculating piping systems. The system contains a primary loop containing three chillers, two primary chilled water pumps, and piping. Chilled water is circulated to the three secondary loops, the steam tunnel cooler (outside containment) and the radwaste building fan coil. Secondary loops serve the auxiliary building and containment, the turbine building, and the control building. Each secondary loop contains two pumps, fan coil units, sample coolers, and piping. A chemical addition tank is available to chemically treat the system to prevent corrosion, and an expansion tank is provided to pressurize the system.

The PCW system includes pressure boundary components for the penetrations in the primary and secondary containments. PCW piping and components inside the auxiliary building form a closed system which provides the secondary containment pressure boundary for this system. The safety-related penetration components and nonsafety-related components of the closed system support the containment pressure boundary.

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

- Support containment pressure boundary.

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

- Support containment 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 PCW system has no intended functions for 10 CFR 54.4(a)(3).

UFSAR References

Section 9.2.7

Components Subject to Aging Management Review

Some heat exchanger components are reviewed in Section 2.3.3.9, Plant Service Water. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining PCW system components are reviewed as listed below.

Table 2.3.3-14 lists the component types that require aging management review.

Table 3.3.2-14 provides the results of the aging management review.

License Renewal Drawings

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

LRA-M-1072D	LRA-M-1106A
LRA-M-1103A	LRA-M-1109A
LRA-M-1104A	LRA-M-1109D
LRA-M-1104B	LRA-M-1109F

2.3.3.15 Standby Diesel Generator

System Description

The purpose of the standby diesel generator (SDG) system (system code P75) is to provide power in the event of a loss of offsite power to the ESF electrical loads for safe reactor shutdown and to mitigate the consequences of a design basis accident such as a LOCA. Standby AC power is supplied by three diesel generators. Each ESF division is supplied by a separate diesel generator. The diesel generators that supply power to ESF Divisions 1 and 2 comprise the standby diesel generator system. ESF Division 3 is supplied by the HPCS diesel generator system (see Section 2.3.3.16, HPCS Diesel Generator).

The diesel generator starts automatically on a LOCA signal and following the loss of the offsite power source feeding the ESF bus. Prior to connecting the diesel generator, loads are shed from the ESF bus. Upon reaching rated voltage and frequency, the diesel generators are connected to their respective bus. Loads are then sequentially connected to the bus by the automatic sequencer.

The SDG system includes the diesel generators for ESF Divisions 1 and 2 and the supporting auxiliary subsystems for the diesels. Each diesel engine is a vertical frame, four-cycle, turbocharged, multicylinder, stationary V-type with a maximum speed of 514 rpm, rated speed 450 rpm, and a continuous rated output of 7000 kW. The auxiliary subsystems include fuel oil, cooling water, starting air, lubricating oil and combustion air intake and exhaust.

Fuel Oil

The standby diesel generator fuel oil system consists of storage tanks, transfer pumps, fuel oil day tanks, fuel oil pumps, and the associated piping, valves, strainers, filters, flame arrestors and controls. Each standby diesel generator has its own individual fuel oil supply components.

The storage tanks, one for each diesel generator, are horizontal buried tanks, each with a storage capacity sufficient to operate its corresponding diesel generator for seven days while supplying post-LOCA maximum load demands. Transfer pumps, one for each diesel generator, are located inside the fuel storage tanks and transfer fuel from the storage tanks to the day tanks. The capacity of each standby diesel generator day tank is equivalent to greater than one hour of engine operation while supplying post-LOCA maximum load demands.

Each standby diesel generator is provided with a 100-percent capacity engine-driven fuel oil pump, and a 100-percent capacity, direct current, motor-driven fuel oil pump for use during maintenance or other times when the engine-driven pump may be unavailable.

Cooling Water

An independent standby diesel cooling water system (DGCWS) is provided for each generator. Each cooling water system consists of pumps, expansion tank, heat exchanger, immersion heater, jacket water heater circulating pump, and the associated piping, valves, and controls.

The DGCWS is a closed system with an expansion tank providing cooling water to the diesel engine, lube oil heat exchanger and turbocharger aftercoolers. Each standby diesel engine is provided with two 100-percent capacity pumps. One pump is motor-driven and the other is driven by the diesel engine. The DGCWS rejects heat to the standby service water system.

Starting Air

An air starting system (DGSS) consisting of two redundant trains is provided for each diesel engine. Each train consists of the air compressors, aftercoolers, air dryers, air receivers, and the associated piping, valves, and controls. The air receiver in each redundant DGSS train is capable of providing the diesel generator with five starts. Only the air receivers and their associated piping and valves are required for operation of the SDGs.

One of the compressors for each diesel generator is driven from a separate diesel engine; the other has an electric motor driver fed from normal balance-of-plant (BOP) power.

An air-to-air type aftercooler is provided on the downstream side of both the diesel- and motor-driven starting air compressors to cool the compressed air prior to entering the air dryer. The compressed air passes on the tube side of the cooler, and cooling air is fan-blown over the finned tubes. Each aftercooler operates continuously in conjunction with its respective compressor.

Each starting air dryer assembly consists of a prefilter, two dehydrator towers, an afterfilter, and the interconnecting piping and valves which control the air flow to each tower.

Lubricating Oil

The diesel engine lube oil system (DELS) provides lubricating oil to all moving parts of the diesel engine and rejects the heat picked up during circulation to the DGCWS via the lube oil heat exchanger. The DELS consists of lube oil pumps, oil sump tank, heat exchanger, heater, and the associated piping, valves, filters, strainers, and controls. The DELS is provided with various filters and strainers to maintain the required quality of the lube oil during engine operation.

The DELS has a separate sump tank for holding the lubricating oil supply. The lube oil sump tank contains a sufficient quantity of oil for 7 days of diesel generator operation.

Each standby diesel engine is provided with two 100-percent capacity pumps. One pump is engine driven and a second pump is AC motor driven.

A separate pre-lube pump takes oil warmed by the sump tank immersion heater from the sump and circulates it through a pre-lube filter to the engine headers. This process keeps essential parts of the engine warmed and lubricated while the diesel engine generator is in a standby status. The heater and pre-lube pump are not safety-related and are not required for operation of the SDGs.

Combustion Air Intake and Exhaust

The diesel generator combustion air intake and exhaust system (DGCAIES) consists of the intake air filter, intake air silencer, exhaust silencer, and the associated piping and expansion joints. An independent DGCAIES is provided for each diesel generator. The DGCAIES provides filtered ambient air to the diesel engines for combustion and exhausts the products of combustion to the atmosphere. Air for combustion is taken from within the diesel generator room via the room's ventilation system.

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

- Supply standby power to the Division 1 and 2 safety-related equipment required to shut down the reactor, maintain the reactor in a safe shutdown condition, and mitigate the consequences of an accident, in the event of a loss of preferred power.

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

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

UFSAR References

Section 8.3.1.1	Section 9.5.6
Section 9.5.4	Section 9.5.7
Section 9.5.5	Section 9.5.8

Components Subject to Aging Management Review

Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions [10 CFR 54.4(a)(2)] not included in other reviews are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2). Remaining SDG 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-M-1070A

LRA-M-1070B

LRA-M-1070C

LRA-M-1070D

2.3.3.16 HPCS Diesel Generator

System Description

The purpose of the HPCS diesel generator (HPCSDG) system (system code P81) is to provide power, in the event of a loss of offsite power, to the HPCS pump motor and supporting system components. The HPCSDG provides power to ESF Division 3. In conjunction with the standby diesel generator (SDG) system, which provides standby power to ESF Divisions 1 and 2, the HPCSDG system provides power for safe reactor shutdown and to mitigate the consequences of a design basis accident such as a LOCA.

The HPCS diesel generator starts automatically on a signal from the plant protection system or the HPCS supply bus undervoltage systems. The diesel generator connects to the Division 3 bus when the plant preferred AC power supply is not available and the Division 3 bus feeder breaker trips. The Division 3 bus has no shedding or sequencing.

The HPCSDG system includes the diesel generator for ESF Division 3 and the supporting auxiliary subsystems. The HPCSDG uses two turbocharged two-stroke, 12 cylinder, V-type diesel engines in tandem. The auxiliary subsystems include fuel oil, cooling water, starting air, lubricating oil, and combustion air intake and exhaust.

Fuel Oil

The HPCS diesel generator fuel oil system consists of storage tanks, transfer pumps, fuel oil day tanks, fuel oil pumps, and the associated piping, valves, strainers, filters, and controls.

The storage tank is a horizontal buried tank with a storage capacity sufficient to operate the diesel generator for seven days while supplying post-LOCA maximum load demands. A transfer pump is located inside the fuel storage tank and transfers fuel from the storage tank to the day tank. The capacity of the day tank is equivalent to greater than one hour of engine operation while supplying post-LOCA maximum load demands.

Each of the two engines of the tandem HPCS diesel generator is provided with two 100-percent capacity fuel oil pumps, each of which serves a mutually redundant fuel oil system external to the engine fuel manifolds. Either fuel oil pump is capable of supplying fuel oil to the engine. One pump is driven by its respective diesel engine and the redundant pump is motor driven. For each engine, both pumps normally operate and transfer fuel from the day tank to the engine fuel header.

Cooling Water

An independent standby diesel cooling water system (DGCWS) is provided for the HPCSDG. The cooling water system consists of pumps, expansion tank, heat exchanger, immersion heater, and the associated piping, valves, and controls.

The DGCWS is a closed system with an expansion tank providing cooling water to the diesel engine, lube oil heat exchanger, and turbocharger aftercoolers. The DGCWS rejects heat to the standby service water system.

Each engine of the tandem HPCS diesel generator is provided with two 50-percent-capacity pumps. Both pumps are driven by the diesel engine. When the diesel engines are in the standby condition, the cooling water is maintained at a constant temperature by circulating through a separate electric immersion heater. This keep warm feature provides the engine with the capability of quick start and load acceptance after a shutdown.

Starting Air

An air starting system consisting of two redundant trains is provided for each engine of the tandem arrangement. Each train consists of the air compressors, air dryer package, air receivers, air start motors, and the associated piping, valves, and controls. The air supply system contains two air receivers in each of the two trains for a total of four receivers. Each train has one air compressor for charging air into the receivers, the air compressor for one train being electric-motor driven and the compressor for the other train being diesel-engine driven. Only the air receivers and their associated piping and valves to the diesel generator air start motors are required for operation of the HPCSDG.

The air is delivered to the air receivers by the air compressors where it is stored until it is needed to start the diesel engine. An aftercooler/dryer assembly is provided on the downstream side of the diesel-driven and motor-driven starting air compressors. The aftercooler cools the compressed air prior to entering the air dryer. The air dryer consists of a prefilter, two dehydrator towers, an afterfilter and the interconnecting piping and valves which control the air flow to each tower.

Lubricating Oil

The diesel engine lube oil system (DELS) provides lubricating oil to all moving parts of the diesel engine and rejects the heat picked up during circulation to the diesel cooling water system via the lube oil heat exchanger. Each engine of the tandem HPCS diesel generator is provided with a complete engine lubricating oil system comprised of four separate subsystems: the main lubricating oil system, the piston cooling oil system, the scavenging oil system, and the soak back oil system. Each subsystem has its own pump. The main lube oil pump and the piston cooling oil pump, although individual pumps, are both contained in a single housing and driven from a common drive shaft. The scavenging oil pump is a separate pump. With the exception of the soak back pump, all the pumps are driven from the accessory gear train at the front of the engine.

To ensure lubrication of the turbocharger bearings prior to engine start and removal of the residual heat from the turbocharger after engine shutdown, a separate lube oil pressure source is provided by a continuously running AC motor-driven soak back pump. The soak back pump also circulates oil from the lube oil sump through the lube oil filter to the lube oil cooler. The immersion heater heats the engine cooling water which circulates by natural convection through the lube oil cooler tubes. As the oil is circulated through the lube oil cooler, around the tubes (which act as a heater at this time), the oil is warmed. The oil leaves the lube oil cooler and flows to the engine lube oil strainer housing, thus maintaining a full reservoir for the main lube oil and piston cooling pumps.

Combustion Air Intake and Exhaust

The diesel generator combustion air intake and exhaust system (DGCAIES) consists of the intake air filter, intake air silencer, exhaust silencer, and the associated piping and expansion joints. An independent DGCAIES is provided for each diesel generator. The DGCAIES provides filtered ambient air to the diesel engines for combustion and exhausts the products of combustion to the atmosphere. Air for combustion is taken from within the diesel generator room via the room's ventilation system.

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

- Supply standby power to the Division 3 safety-related equipment of the HPCS and supporting systems required for the operation of the HPCS system in the event of a loss of preferred power.

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

UFSAR References

Section 8.3.1.1	Section 9.5.6
Section 9.5.4	Section 9.5.7
Section 9.5.5	Section 9.5.8

Components Subject to Aging Management Review

Some components of the jacket water cooler are reviewed in Section 2.3.3.7, Standby Service Water. Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining system 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 drawings.

LRA-M-1093A

LRA-M-1093B

LRA-M-1093C

2.3.3.17 Control Room Heating, Ventilation and Air Conditioning

System Description

The purpose of the control room heating, ventilation and air conditioning (CRHVAC) system (system code Z51) is to provide an environment in the control room suitable for the operation of safety-related equipment under accident conditions and for the comfort and safety of the operators. The system includes the control room air conditioning and standby fresh air subsystems. The air conditioning subsystem provides temperature control for the control room. The standby fresh air subsystem provides a radiologically controlled environment from which the unit can be safely operated following an accident. The control room HVAC system provides ventilation for the control room envelope consisting of all rooms at the control room elevation of the control building. Airtight doors are provided at the access points to the control room envelope.

The control room air conditioning subsystem consists of two independent, redundant subsystems that provide cooling and heating of recirculated control room air. Each subsystem consists of heating coils, cooling coils, fans, chillers, compressors, ductwork, dampers, and instrumentation and controls to provide for control room temperature control.

The standby fresh air subsystem consists of redundant isolation valves in each inlet and exhaust flow path and two independent and redundant high efficiency air filtration trains for treatment of recirculated air or outside supply air. Each filtration train consists of a demister, an electric heater, a prefilter, two HEPA filters, a fan, and the associated ductwork and dampers. Demisters remove water droplets from the airstream. Prefilters and HEPA filters remove particulate matter that may be radioactive.

During normal plant operation, control room air is recirculated through one full-capacity air-conditioning unit to maintain control room design conditions. Fresh air makeup is provided from a single intake located on the roof of the control building. Cooling water for the control room air-conditioning condenser units is normally supplied by the plant service water system, with automatic switchover to the standby service water system in the event of a loss-of-coolant accident or loss of offsite power.

The control room is normally maintained at a slightly positive pressure (from fresh air makeup with respect to other plant ventilation zones) to prevent introduction of air into the control room from sources other than the design fresh air makeup system.

The control room standby air unit is designed to process a portion of the control room air conditioning system flow through a filter train during post-accident operation. During the recirculation mode, a portion of the return air from the control room is drawn through the particulate train by the standby air unit fan for cleanup of the control room atmosphere. This air is then mixed with the remaining control room air conditioning system return air and supplied to the control room.

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

- Provide a suitable environment during normal and accident conditions for the operation of safety-related equipment in the control room envelope.
- Limit operator exposure to hazardous chemical and radioactive releases.

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

UFSAR References

Section 6.4

Section 9.4.1

Components Subject to Aging Management Review

Nonsafety-related components of the system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining system components are reviewed as listed below.

Table 2.3.3-17 lists the component types that require aging management review.

Table 3.3.2-17 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-M-0049	LRA-M-1061D
LRA-M-1061C	LRA-M-1108A

2.3.3.18 Heating, Ventilation and Air Conditioning

System Description

The heating, ventilation and air conditioning (HVAC) components at GGNS are divided into separate system codes. The HVAC systems listed below (with system codes) and described in separate subsections are included in this aging management review.

- Containment Cooling (M41)
- Drywell Cooling (M51)
- Auxiliary Building Ventilation (T41)
- Fuel Handling Area Ventilation (T42)
- ESF Electrical Switchgear Rooms Cooling (T46)
- Emergency Pump Room Ventilation (T51)
- Turbine Building Ventilation (U41)
- Diesel Generator Building Ventilation (X77)
- Standby Service Water Pumphouse Ventilation (Y47)
- Fire Water Pumphouse Ventilation (Y67)
- Control Building HVAC (Z17)
- Emergency Switchgear and Battery Rooms Ventilation (Z77)

The standby gas treatment system and control room HVAC system are covered by separate aging management reviews (Section 2.3.2.6 and Section 2.3.3.17, respectively).

Building louvers mounted in the external walls and fire dampers are reviewed with the structure. If a fire damper is included as part of a safety-related ductwork where pressure boundary is required to support the ventilation system function, the damper housing is included in this section’s review to verify the pressure boundary.

Containment Cooling

The purpose of the containment cooling system (system code M41) is to provide an environment suitable for normal operation of equipment in containment necessary for power generation. The containment cooling system includes subsystems for cooling and for ventilation and filtration. The cooling subsystems cool and recirculate the containment atmosphere to maintain suitable temperature and humidity during normal operation. During normal operation, the ventilation and filtration subsystem provides fresh air for personnel comfort and limits airborne radioisotopes. The system includes piping, valves and dampers supporting the containment pressure boundary. With the exception of the containment pressure boundary function, the system has no safety function. The system is not credited for post-accident cooling or filtration.

The containment cooling subsystem consists of three half-capacity recirculation coolers and the associated dampers, ducting, and controls required to maintain suitable containment temperature and relative humidity. Each containment cooler consists of a cooling coil and fan. Normally, two fan-coil units operate with one on common standby. The cooling system supplies conditioned air through ductwork and grilles.

A separate cooling subsystem is provided for the steam tunnel inside containment. This subsystem consists of two cooling coils and two vane axial fans.

The containment ventilation and filtration subsystems consist of two containment ventilation supply fans and two drywell containment purge fans that provide fresh outside air to the containment and drywell, one containment exhaust charcoal filter train, two containment ventilation exhaust fans, and the associated ducting, dampers, and controls. The containment ventilation and filtration subsystems also include two containment cooling system charcoal filter trains, each with a centrifugal fan, that continuously recirculate a portion of the containment atmosphere to limit the concentration of airborne radioiodines to an acceptable level during normal operation. The containment exhaust charcoal filter train and each containment cooling system charcoal filter train consist of the following components arranged in series with respect to the air flow: demister, heating coil, prefilter, HEPA filter bank, charcoal filter bank, and HEPA filter bank.

A separate charcoal filter train with centrifugal fan provides ventilation for the reactor water sampling station. The filter train consists of the following components arranged in series with respect to the air flow: prefilter, heating coil, HEPA filter bank, charcoal filter bank, and HEPA filter bank.

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

- Support containment pressure boundary.

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

Drywell Cooling

The purpose of the drywell cooling system (system code M51), in conjunction with the containment cooling system, is to maintain an environment suitable for equipment in the drywell during normal plant operation. The drywell cooling system consists of recirculating fan-coil units and the associated dampers, ducting, and controls required to maintain the design drywell temperature and relative humidity. Purging of the drywell atmosphere is provided by the containment cooling system. The drywell cooling system includes piping and valves that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function. The system is not credited for post-accident cooling.

Each fan-coil unit consists of two full-capacity fans in parallel and two full-capacity cooling coils in series. Six fan-coil units are provided to distribute cooling air effectively and with minimum ductwork. Normally, one fan and one coil of each fan-coil unit operate, and the other fan and coil are on standby. Additionally, the drywell cooling system incorporates two recirculation fans and associated controls and ducting which transfer air from the upper elevation to the lower elevation. These fans alleviate heat stratification in the drywell. Normally, both fans operate simultaneously.

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

- Support containment pressure boundary.

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

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

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

Auxiliary Building Ventilation

The purpose of the auxiliary building ventilation (ABV) system (system code T41) is to provide an environment with controlled temperature and humidity to ensure the comfort and safety of personnel and the integrity of auxiliary building equipment during normal operation. The ABV system includes duct and dampers that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function. The system is not credited for post-accident cooling.

The auxiliary building is divided into six HVAC zones. The ABV system supports all but one zone, the fuel handling area, which is serviced by the fuel handling area ventilation system. Four of the zones correspond to four floors of the auxiliary building. Each of these zones is provided with one full-capacity zone fan-coil unit, with duct-mounted heating coils, designed for both heating and cooling.

The remaining auxiliary building HVAC zone is the outside containment steam tunnel. This zone is provided with a fan-coil unit consisting of two fans in parallel with respect to the airflow and two cooling coils in series with respect to the airflow.

During normal operation, the four fan-coil units provide cooling to rooms throughout the auxiliary building, including rooms occupied by ECCS equipment, which is normally idle. When this ECCS equipment is in operation, cooling is provided by additional safety-related cooling equipment. A separate, nonsafety-related air conditioning unit, which is part of the ABV system, is installed in the RHR C pump room to maintain normal room temperatures during ADHRS operation.

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

- Support containment pressure boundary.

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

Fuel Handling Area Ventilation

The purpose of the fuel handling area ventilation (FHAV) system (system code T42) is to provide an environment with controlled temperature and humidity to ensure the comfort and safety of personnel and the integrity of fuel handling area equipment during normal operation. The FHAV system includes duct and dampers that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function. The system is not credited for post-accident cooling.

During normal operation, the fuel handling area is ventilated and maintained at a slightly negative pressure with respect to surrounding areas. Two full-capacity supply fans and two full-capacity exhaust fans are provided. The supply fans draw filtered outside air into the fuel handling area. Air from the fuel handling area vents outside via the exhaust fans.

The fuel pool sweep subsystem, which is idle during normal operations, is used during fuel-handling operations. Two full-capacity fuel pool sweep supply fans and two full-capacity fuel pool sweep exhaust fans provide a controlled circulation of air across the surface of the spent fuel pool, the cask storage pool, and the transfer canal. The fuel pool sweep supply fan delivers a high volume of outside air and directs a portion of this air across the surface of the pools. The remainder of the air not discharged directly across the pool surfaces is supplied to the fuel handling area above the vicinity of the pools as makeup air for the fuel pool sweep exhaust fans.

The FHAV system includes two full-capacity fan-coil units each consisting of a fan, a cooling coil, an electrical heater, and a prefilter. Located on different elevations of the fuel handling area, these units recirculate the atmosphere to maintain suitable conditions. A separate fan-coil unit provides cooling to the reactor vessel vibration test room.

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

- Support containment pressure boundary.

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

ESF Electrical Switchgear Rooms Cooling

The purpose of the ESF electrical switchgear rooms cooling (ESFESRC) system (system code T46) is to maintain an environment with controlled temperature to ensure the safety of personnel and the integrity of plant equipment. The ESF electrical switchgear rooms are located in the auxiliary building. Each room is provided with one full-capacity fan-coil unit which maintains the space design temperature when the associated electrical equipment is operating, during all modes of normal and emergency plant operation. Cooling water is provided to the cooling coils by either plant service water or standby service water.

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

- Maintain a suitable room temperature to support operation of the ESF electrical switchgear.

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

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

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

Emergency Pump Room Ventilation

The purpose of the emergency pump room ventilation (EPRV) system (system code T51) is to maintain an environment with controlled temperature to ensure the integrity of plant equipment. Each ECCS pump room and the RCIC pump room are provided with one full-capacity fan-coil unit to maintain suitable room temperature during pump operation. Two fan-coil units are provided as backup to the auxiliary building cooling system for the FPCC pump room. The standby service water system provides cooling water for the fan-coil units.

The EPRV system is in standby during normal operation. During normal plant operation, the environment of the safety-related pump rooms and penetrations rooms is maintained by the fuel handling area ventilation system and auxiliary building ventilation system.

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

- Maintain a suitable room temperature to support operation of equipment in the ECCS pump rooms and associated piping penetration rooms.
- Maintain a suitable room temperature to support operation of equipment in the RCIC pump room.
- Maintain a suitable room temperature to support operation of equipment in the FPCC pump room during loss of normal ventilation.

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

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

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

Turbine Building Ventilation

The purpose of the turbine building ventilation (TBV) system (system code U41) is to provide an environment with controlled temperature and humidity to ensure both the safety of plant personnel and the integrity of equipment and components. The TBV system includes a variety of subsystems that heat, cool and ventilate the turbine building areas.

Outside air is introduced into the turbine building above the operating floor, and through the turbine building rollup door if open, then drawn down to the areas below the floor by the exhaust system during normal plant operations. Space fan-coil terminal units are located throughout the turbine building to provide the heating and cooling capacity required to maintain suitable temperatures. The units consist of fans, water coils, and cabinets. Ductwork is kept to a minimum.

The main turbine building exhaust air system consists of two full-capacity exhaust air fans in parallel, filter housing (including prefilters, HEPA filters and charcoal), isolation dampers, ductwork, and controls. The filtration function is not credited in dose calculations.

The system includes fire dampers in the ventilation flow path between rooms.

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

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

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

Diesel Generator Building Ventilation

The purpose of the diesel generator building ventilation (DGBV) system (system code X77) is to maintain a suitable room environment for equipment and personnel. The DGBV system consists of three independent full-capacity subsystems, one per diesel generator room.

Each subsystem consists of a nonsafety-related fan-coil unit that maintains suitable room conditions when the diesel is idle. A heating coil has been provided to maintain the minimum required inside air temperature during cold weather.

Each subsystem also includes a safety-related fan system connected to the respective diesel engineered safety features bus. The fan is controlled to start on diesel generator startup and provides outside air to maintain the room at a suitable temperature. The fan also provides diesel combustion air.

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

- Maintain a suitable room temperature to support operation of equipment in the diesel generator rooms when the diesels are operating.
- Provide combustion air to the diesel generators.

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

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

Standby Service Water Pumphouse Ventilation

The purpose of the standby service water pumphouse ventilation (SSWPV) system (system code Y47) is to maintain a suitable environment for personnel and for the operation of the SSW pumps, the HPCS service water pump, and associated equipment. The SSWPV system consists of three full-capacity fans utilizing separate ducting, dampers, and controls to maintain the area temperature below the allowable maximum. Two of the fans are located in the SSW pumphouse "A" and the other is located in pumphouse "B." In pumphouse "A" one fan is supplied with power from the Division I ESF bus and starts when its associated SSW pump starts or on high area temperature. The other fan is supplied with power from the Division II ESF bus and starts only in response to a high area temperature. The fan in pumphouse "B" is supplied with power from the Division II ESF bus and starts when its associated pump starts or on high area temperature.

Nonsafety-related unit heaters are provided for winter shutdown freeze protection. Unit heaters are provided in each pumphouse and in each SSW valve room.

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

- Maintain a suitable area temperature to support operation of equipment in SSW pumphouse A and B when the SSW and HPCS service water pumps are operating.

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

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

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

Fire Water Pumphouse Ventilation

The purpose of the fire water pumphouse ventilation (FWPV) system (system code Y67) is to maintain an environment suitable for equipment operation and personnel. The fire water pump house is divided into three compartments separated by fire walls. Each compartment has an individual ventilation system that consists of a power roof ventilator and electric unit heater. Each roof ventilator is controlled by a space thermostat located in the compartment. Outside air is induced and exhausted by the roof ventilator to maintain the space temperature. The electric unit heaters maintain thermostat temperature setting when the roof ventilator fan is stopped.

The FWPV system supports the operation of the fire protection system pumps and related equipment.

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

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

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

Control Building HVAC

The purpose of the control building heating ventilating and air conditioning (CBHVAC) system (system code Z17) is to provide a reliable source of fresh air and an environment with controlled temperature and humidity to ensure the comfort and safety of personnel and the integrity of control building equipment during normal operation. The CBHVAC system includes duct and dampers that are conservatively classified as safety-related to assure reliable operation; however, the system has no safety function. The system is not credited for post-accident cooling.

The CBHVAC system includes several subsystems that provide ventilation for control building areas other than the control room. These areas include the computer room, hot machine shop, access control area, control building elevator machinery room, HVAC equipment room, and the upper and lower cable spreading rooms.

The CBHVAC system includes the control building purge subsystem, which uses a single fan with branched connections to the HVAC equipment room, upper and lower cable spreading rooms, and control room. The branches into the HVAC equipment room and cable spreading rooms contain normally closed motor-operated dampers. Isolation butterfly valves are provided on the control room purge exhaust line.

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

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

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

Emergency Switchgear and Battery Rooms Ventilation

The purpose of the emergency switchgear and battery rooms ventilation (ESBRV) system is to provide a reliable source of fresh air and an environment with controlled temperature and humidity to ensure the comfort and safety of personnel and the integrity of plant equipment. The system provides ventilation for the Division I, II and III switchgear rooms and battery rooms and the remote shutdown panel room. The system can also provide ventilation cooling in the control building HVAC equipment room under accident and post-accident conditions, or upon failure of the normal control building HVAC system.

The supply system consists of four half-capacity fan units complete with outside air filters, electric heating coils, supply air ducts, and controls. Two supply fans operate at all times while the other two fans are on standby. Exhaust air is discharged by four half-capacity exhaust fan units with separate ducts and controls. Two exhaust fans operate at all times while the other two fans are on standby.

The remote shutdown panel room receives additional cooling from a nonsafety-related heat pump which is controlled by a thermostat located in the remote shutdown panel room. The heat pump arrangement consists of a single packaged type heat pump and its associated ductwork and controls

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

- Maintain suitable room temperatures to support operation of the batteries and switchgear.
- Maintain a slight negative pressure in the battery rooms to prevent ex-filtration of hydrogen and maintain battery room hydrogen concentrations within acceptable levels with dilution air and exhaust flow.
- Maintain suitable room temperatures to support operation of safety-related equipment in the control building HVAC equipment room under accident and post-accident conditions.

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

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

UFSAR References

Section 6.2.1.1.2.6: Containment cooling

Section 9.4.2: Fuel Handling Area Ventilation

Section 9.4.4: Turbine Building Ventilation

Section 9.4.5: ESF Electrical Switchgear Rooms Cooling,
Emergency Pump Room Ventilation,
Diesel Generator Building Ventilation,
Standby Service Water Pumphouse Ventilation,
Emergency Switchgear and Battery Rooms Ventilation

Section 9.4.6: Auxiliary Building Ventilation

Section 9.4.7: Containment Cooling

Section 9.4.8: Drywell Cooling

Section 9.4.9: Feedwater Pumphouse Ventilation

Section 9.4.10: Control Building HVAC

Components Subject to Aging Management Review

Components of a containment penetration comprised of both containment cooling and combustible gas control system components are reviewed in Section 2.3.3.5, Combustible Gas Control.

Components of a containment penetration comprised of both drywell cooling and compressed air system components are reviewed in Section 2.3.3.11, Compressed Air.

ABV components that support the PCW and PSW pressure boundary are reviewed in Section 2.3.3.14, Plant Chilled Water, and Section 2.3.3.9, Plant Service Water, respectively.

FHAV components that support the PCW pressure boundary and DGBV room cooler coils are reviewed in Section 2.3.3.14, Plant Chilled Water.

Nonsafety-related HVAC components whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.3.19, Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2).

Remaining HVAC components, including components of the CBHVAC system conservatively classified as safety-related, are reviewed as listed below.

Table 2.3.3-18 lists the component types that require aging management review.

Table 3.3.2-18 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-M-0050A	LRA-M-1100A	LRA-M-1106A
LRA-M-0050C	LRA-M-1101	LRA-M-1106B
LRA-M-0051A	LRA-M-1103A	LRA-M-1108A
LRA-M-1061B	LRA-M-1104A	LRA-M-1108B
LRA-M-1061C	LRA-M-1104B	
LRA-M-1061D		

2.3.3.19 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 GGNS, certain components and piping outside the safety class pressure boundary must be structurally sound in order 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 this review. 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
C11	CRD Hydraulic	Section 2.3.3.1, Control Rod Drive
C41	Standby Liquid Control	Section 2.3.3.2, Standby Liquid Control
D17	Process Radiation Monitoring	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
E31	Leak Detection	Section 2.3.3.4, Leakage Detection and Control
E32	MSIV Leakage Control	Section 2.3.3.4, Leakage Detection and Control
E61	Combustible Gas Control	Section 2.3.3.5, Combustible Gas Control
G33, G36	Reactor Water Cleanup	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
G41, G46	Fuel Pool Cooling and Cleanup	Section 2.3.3.6, Fuel Pool Cooling and Cleanup
G50	CRD Maintenance Facility, Flush Tank Filter and Leak Test	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
M41	Containment Cooling	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
M51	Drywell Cooling	Section 2.3.3.18, Heating, Ventilation and Air Conditioning

System Code	System Name	Section Describing System
M61	Containment Leak Rate Test	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
N12	Auxiliary Steam	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P21	Makeup Water Treatment	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P33	Process Sampling	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P41	Standby Service Water	Section 2.3.3.7, Standby Service Water
P42	Component Cooling Water	Section 2.3.3.8, Component Cooling Water
P43	Turbine Building Cooling Water	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P44	Plant Service Water	Section 2.3.3.9, Plant Service Water
P45, P48	Floor and Equipment Drainage	Section 2.3.3.10, Floor and Equipment Drainage
P51, P52, P53	Compressed Air	Section 2.3.3.11, Compressed Air
P60	Suppression Pool Cleanup	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P64	Fire Protection	Section 2.3.3.12, Fire Protection – Water
P66	Domestic Water	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P71	Plant Chilled Water	Section 2.3.3.14, Plant Chilled Water
P72	Drywell Chilled Water	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
P75	Standby Diesel Generator	Section 2.3.3.15, Standby Diesel Generator
P81	HPCS Diesel Generator	Section 2.3.3.16, HPCS Diesel Generator
P87	NobleChem™ Injection and Monitoring	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)

System Code	System Name	Section Describing System
T41	Auxiliary Building Ventilation	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
T42	Fuel Handling Area Ventilation	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
U41	Turbine Building Ventilation	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
X77	Diesel Generator Building Ventilation	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
Z17	Control Building HVAC	Section 2.3.3.18, Heating, Ventilation and Air Conditioning
Y70, Z18	Sanitary Waste	Section 2.3.3.19, Auxiliary Systems in Scope for 10 CFR 54.4(a)(2)
Z51	Control Room HVAC	Section 2.3.3.17, Control Room Heating, Ventilation and Air Conditioning
Z77	Emergency Switchgear and Battery Rooms Ventilation	Section 2.3.3.18, Heating, Ventilation and Air Conditioning

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 2.3.2.7, Containment Penetrations for primary containment penetrations). Of the systems described below, only reactor water cleanup has an intended function for 10 CFR 54.4(a)(3).

Process Radiation Monitoring

The purpose of the process radiation monitoring (PRM) system (system code D17) is to determine the content of radioactive material in various gaseous and liquid process and effluent streams. The system includes radiation monitors and monitoring subsystems on process liquid and gas lines that may serve as discharge routes for radioactive materials. Protective actions are initiated by some monitoring subsystems to limit the release of radioactive materials. Other monitoring subsystems provide information for operational requirements.

The PRM system monitors the main steam lines, ventilation systems, gaseous process systems and liquid process systems. Monitoring subsystems such as those for the main steam lines and control room air intake consist of EIC components. Other monitoring subsystems include mechanical components such as pumps, blowers, sample probes, piping and valves.

In addition to its intended function for 10 CFR 54.4(a)(2), the PRM system has the following intended functions for 10 CFR 54.4(a)(1).

- Monitor plant effluent streams to limit release of radioactive materials.
- Maintain safety-related system pressure boundary of monitored system (standby service water).

UFSAR Reference: Section 7.6 and Section 11.5

Components of the PRM system supporting the standby service water system pressure boundary are reviewed in Section 2.3.3.7, Standby Service Water. Components of the PRM system supporting the plant service water system pressure boundary are reviewed in Section 2.3.3.9, Plant Service Water.

Reactor Water Cleanup

The purpose of the reactor water cleanup (RWCU) system (system codes G33, G36) is to remove particulate and dissolved impurities from the reactor coolant by recirculating a portion of the reactor coolant through a filter-demineralizer. The system also removes excess coolant from the reactor system by routing processed water to the main condenser or to radwaste rather than the reactor vessel.

The RWCU system includes two system codes. The reactor water cleanup system (G33) includes the reactor water cleanup pumps, which provide the recirculation flow, and the regenerative and non-regenerative heat exchangers that cool the recirculated coolant before cleanup and reheat (regenerative heat exchanger) the coolant before its return to the reactor coolant system via the RHR system. The filter/demineralizer system (G36) includes the filter/demineralizers and regeneration equipment for coolant cleanup.

The RWCU system includes components that form part of the reactor coolant system and RHR system pressure boundaries and components that support the containment pressure boundary. With the exception of these pressure boundary functions, the system has no safety function.

In addition to its intended function for 10 CFR 54.4(a)(2), the RWCU system has the following intended functions for 10 CFR 54.4(a)(1).

- Maintain integrity of reactor coolant pressure boundary.
- Maintain integrity of the RHR system pressure boundary.
- Support containment pressure boundary.

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

- Perform a function (isolate reactor coolant blowdown to the condenser) that demonstrates compliance with the Commission's regulations for fire protection (10 CFR 50.48).

UFSAR Reference: Section 5.4.8

Class 1 components supporting the reactor coolant pressure boundary are reviewed in Section 2.3.1.2, Reactor Coolant Pressure Boundary. Components that support the RHR system pressure boundary are reviewed in Section 2.3.2.1, Residual Heat Removal. Components that support containment pressure boundary, including those that perform the fire protection function, are reviewed in Section 2.3.2.7, Containment Penetrations. One component of a penetration cooling jacket is reviewed in Section 2.3.3.14, Plant Chilled Water. A limited number of components supporting the leakage detection system are reviewed in Section 2.3.3.4, Leakage Detection and Control.

CRD Maintenance Facility, Flush Tank Filter and Leak Test

The purpose of the CRD maintenance facility, flush tank filter and leak test system (system code G50) is to provide equipment used for maintenance on control rod drives during outages. The system provides the means to clean (decontaminate) and leak test the drives. The system has no safety functions.

UFSAR Reference: None

Containment Leak Rate Test

The purpose of the containment leak rate test (CLRT) system (system code M61) is to provide equipment used to conduct the primary reactor containment integrated leak rate test during outages. The system includes equipment to pressurize containment with air and the pressure and temperature instruments used to quantify leakage from the pressurized containment. The CLRT system includes piping and valves that support the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function.

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

- Support containment pressure boundary.

UFSAR Reference: Section 6.2.6

Components that support containment pressure boundary are reviewed in Section 2.3.2.7, Containment Penetrations.

Auxiliary Steam

The original purpose of the auxiliary steam system (system code N12) was to furnish a separate and independent steam supply to support startup, testing or operation of various equipment. This function is now performed by other process systems and the auxiliary steam system has been abandoned, isolated and drained. A few system components remain in service to provide isolation of other systems. None of the remaining components provide isolation for safety-related systems.

UFSAR Reference: Section 9.5.9

Makeup Water Treatment

The purpose of the makeup water treatment (MUWT) system (system code P21) is to provide high-quality water for startup and normal operation. Water from the radial wells is supplied by the plant service water system to the makeup water treatment system clearwell tank where the water is stored. The well water is passed through activated carbon filters then through a vendor-provided water treatment trailer. The permanently installed plant water treatment equipment consisting of a layered-bed cation exchanger and a layered-bed anion exchanger is not normally used. The processed water is stored in the demineralized water storage tank. From the storage tank, demineralized water is distributed, as required, to plant equipment and systems.

The MUWT system includes piping and valves that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function.

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

- Support containment pressure boundary.

UFSAR Reference: Section 9.2.3

Components that support containment pressure boundary are reviewed in Section 2.3.2.7, Containment Penetrations. Components supporting level instruments on the condensate storage tank are reviewed in Section 2.3.4.1, Condensate and Refueling Water Storage and Transfer.

Process Sampling

The purpose of the process sampling system (system code P33) is to provide process information needed to monitor plant and equipment performance and changes to operating parameters. Representative liquid and gas samples are taken automatically and/or manually during normal plant operation for laboratory or on-line analyses.

The process sampling system provides sampling of all principal fluid process streams associated with plant operation. The process sampling system consists of permanently installed sampling nozzles and sample lines, sampling panels with analyzers, associated sampling equipment, and provisions for local grab sampling.

The process sampling system includes piping and valves for the post-accident sampling station that form part of the safety-related pressure boundary of the suppression pool makeup system level instrumentation and the containment and drywell instrument and control system pressure instrumentation. With the exception of this pressure boundary support function, the system has no safety function.

In addition to its intended function for 10 CFR 54.4(a)(2), the process sampling system has the following intended function for 10 CFR 54.4(a)(1).

- Support safety-related pressure boundary of instrument systems.

UFSAR Reference: Section 9.3.2

Components that support the safety-related pressure boundary of the drywell instrument and control system pressure instrumentation are reviewed in Section 2.3.2.7, Containment Penetrations. Components that support the safety-related pressure boundary of the suppression pool makeup system level instrumentation are reviewed in Section 2.3.3.3, Suppression Pool Makeup.

Turbine Building Cooling Water

The purpose of the turbine building cooling water (TBCW) system (system code P43) is to cool auxiliary plant equipment associated with the power conversion systems in the turbine, radwaste, and water treatment buildings. The TBCW system is a closed cooling water system consisting of recirculation pumps, heat exchangers, coolers, a chemical addition tank, a surge tank, and associated piping, valves, and controls. Cooling for the TBCW heat exchangers is provided by the plant service water system. The TBCW system serves no safety function.

UFSAR Reference: Section 9.2.9

Suppression Pool Cleanup

The purpose of the suppression pool cleanup (SPCU) system (system code P60) is to remove radioactive iodine and particulates from the containment suppression pool water and to maintain the suppression pool water quality to meet plant operation requirements. The system is operated as required to remove impurities from the suppression pool and minimize operator exposure.

The SPCU system consists of piping, valves, and instrumentation. The system does not have any unique major components. The system makes use of the refueling water transfer pumps or RHR pump C, condensate precoat filters, and condensate demineralizers.

The SPCU system includes piping and valves that are part of the containment pressure boundary. With the exception of the support functions for the RHR system and containment pressure boundaries, the system has no safety function.

In addition to its intended function for 10 CFR 54.4(a)(2), the SPCU system has the following intended functions for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.
- Support the RHR system pressure boundary.

UFSAR Reference: Section 9.3.6

Components that support the RHR system pressure boundary are reviewed in Section 2.3.2.1, Residual Heat Removal. Components that support containment pressure boundary are reviewed in Section 2.3.2.7, Containment Penetrations.

Domestic Water

The purpose of the domestic water system (system code P66) is to provide the necessary supply of domestic water for the plant. Treated water from the construction water system is supplied to the domestic water storage tank. The domestic water distribution system consists of pumps, hot water heaters, and interconnecting piping and valves.

The domestic water system includes piping and valves that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function.

In addition to its intended function for 10 CFR 54.4(a)(2), the domestic water system has the following intended function for 10 CFR 54.4(a)(1).

- Support containment pressure boundary.

UFSAR Reference: Section 9.2.4

Components that support containment pressure boundary are reviewed in Section 2.3.2.7, Containment Penetrations.

Drywell Chilled Water

The purpose of the drywell chilled water (DCW) system (system code P72) is to provide chilled water to the drywell coolers and to the steam tunnel cooler inside containment. Chilled water is produced by mechanical chilling units and supplied to area cooling units through closed recirculating piping systems. The system consists of four half-capacity chillers and two full-capacity chilled water pumps. An expansion section and a chemical feed tank are provided to pressurize and to protect the system from corrosion and scale deposits. The system supports operation of two drywell chillers and one chilled water pump if normal offsite AC power is not available.

The DCW system includes piping and valves that are part of the containment pressure boundary. With the exception of the containment pressure boundary support function, the system has no safety function.

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

- Support containment pressure boundary.

UFSAR Reference: Section 9.2.11

Components that support containment pressure boundary are reviewed in Section 2.3.2.7, Containment Penetrations. Some heat exchanger components are reviewed in Section 2.3.3.9, Plant Service Water.

NobleChem™ Injection and Monitoring

The purpose of the NobleChem™ injection and monitoring system (system code P87) is to support the application of noble metal chemicals to the wetted surfaces of reactor coolant system components for the prevention of intergranular stress corrosion cracking. The system consists of piping, valves, instruments and controls connecting skid-mounted injection equipment to the reactor coolant system through the feedwater system, and monitoring equipment connected to the reactor water cleanup system. The system includes no safety-related components and supports no safety functions.

UFSAR Reference: None

Sanitary Waste

The purpose of the sanitary waste water systems (system codes Y70, Z18) is to process sanitary wastes to produce an effluent quality required by local and state regulations. Components of the control building sanitary waste system (system code Z18 and the sewage treatment plant system (system code Y70) collect and transfer sanitary waste to the sewage treatment plant. These systems serve no safety function.

UFSAR Reference: Section 9.2.4

UFSAR References

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

System Code	System	UFSAR Section
D17	Process Radiation Monitoring	7.6 and 11.5
G33, G36	Reactor Water Cleanup	5.4.8

System Code	System	UFSAR Section
G50	CRD Maintenance Facility, Flush Tank Filter and Leak Test	None
M61	Containment Leak Rate Test	6.2.6
N12	Auxiliary Steam	9.5.9
P21	Makeup Water Treatment	9.2.3
P33	Process Sampling	9.3.2
P43	Turbine Building Cooling Water	9.2.9
P60	Suppression Pool Cleanup	9.3.6
P66	Domestic Water	9.2.4
P72	Drywell Chilled Water	9.2.11
P87	NobleChem™ Injection and Monitoring	None
Y70, Z18	Sanitary Waste	9.2.4

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).

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 in order to provide reasonable assurance that those analysis assumptions remain valid through the period of extended operation.

Series 2.3.3-19-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 3.3.2-19-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
C11	CRD Hydraulic	Table 2.3.3-19-1	Table 3.3.2-19-1
C41	Standby Liquid Control	Table 2.3.3-19-2	Table 3.3.2-19-2
D17	Process Radiation Monitoring	Table 2.3.3-19-3	Table 3.3.2-19-3
E31	Leak Detection	Table 2.3.3-19-4	Table 3.3.2-19-4
E32	MSIV Leakage Control	Table 2.3.3-19-5	Table 3.3.2-19-5
E61	Combustible Gas Control	Table 2.3.3-19-6	Table 3.3.2-19-6
G33 G36	Reactor Water Cleanup	Table 2.3.3-19-7	Table 3.3.2-19-7
G41 G46	Fuel Pool Cooling and Cleanup	Table 2.3.3-19-8	Table 3.3.2-19-8
G50	CRD Maintenance Facility, Flush Tank Filter and Leak Test	Table 2.3.3-19-9	Table 3.3.2-19-9
M41	Containment Cooling	Table 2.3.3-19-10	Table 3.3.2-19-10
M51	Drywell Cooling	Table 2.3.3-19-11	Table 3.3.2-19-11
M61	Containment Leak Rate Test	Table 2.3.3-19-12	Table 3.3.2-19-12
N12	Auxiliary Steam	Table 2.3.3-19-13	Table 3.3.2-19-13
P21	Makeup Water Treatment	Table 2.3.3-19-14	Table 3.3.2-19-14
P33	Process Sampling	Table 2.3.3-19-15	Table 3.3.2-19-15
P41	Standby Service Water	Table 2.3.3-19-16	Table 3.3.2-19-16
P42	Component Cooling Water	Table 2.3.3-19-17	Table 3.3.2-19-17
P43	Turbine Building Cooling Water	Table 2.3.3-19-18	Table 3.3.2-19-18

System Code	System Name	Component Types	AMR Results
P44	Plant Service Water	Table 2.3.3-19-19	Table 3.3.2-19-19
P45 P48	Floor and Equipment Drain	Table 2.3.3-19-20	Table 3.3.2-19-20
P51 P52 P53	Compressed Air	Table 2.3.3-19-21	Table 3.3.2-19-21
P60	Suppression Pool Cleanup	Table 2.3.3-19-22	Table 3.3.2-19-22
P64	Fire Protection	Table 2.3.3-19-23	Table 3.3.2-19-23
P66	Domestic Water	Table 2.3.3-19-24	Table 3.3.2-19-24
P71	Plant Chilled Water	Table 2.3.3-19-25	Table 3.3.2-19-25
P72	Drywell Chilled Water	Table 2.3.3-19-26	Table 3.3.2-19-26
P75	Standby Diesel Generator	Table 2.3.3-19-27	Table 3.3.2-19-27
P81	HPCS Diesel Generator	Table 2.3.3-19-28	Table 3.3.2-19-28
P87	NobleChem™ Injection and Monitoring	Table 2.3.3-19-29	Table 3.3.2-19-29
T41	Auxiliary Building Ventilation	Table 2.3.3-19-30	Table 3.3.2-19-30
T42	Fuel Handling Area Ventilation	Table 2.3.3-19-31	Table 3.3.2-19-31
U41	Turbine Building Ventilation	Table 2.3.3-19-32	Table 3.3.2-19-32
X77	Diesel Generator Building Ventilation	Table 2.3.3-19-33	Table 3.3.2-19-33
Z17	Control Building HVAC	Table 2.3.3-19-34	Table 3.3.2-19-34
Y70 Z18	Sanitary Waste	Table 2.3.3-19-35	Table 3.3.2-19-35
Z51	Control Room HVAC	Table 2.3.3-19-36	Table 3.3.2-19-36
Z77	Emergency Switchgear and Battery Rooms Ventilation	Table 2.3.3-19-37	Table 3.3.2-19-37

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
C11	CRD Hydraulic	LRA-M-1081A LRA-M-1081B LRA-M-1081C
C41	Standby Liquid Control	LRA-M-1082
D17	Process Radiation Monitoring	LRA-M-1107G
E31	Leak Detection	LRA-M-1090A LRA-M-1090B
E32	MSIV Leakage Control	LRA-M-1097
E61	Combustible Gas Control	LRA-M-1091
G33 G36	Reactor Water Cleanup	LRA-M-1079 LRA-M-1080A LRA-M-1080B
G41 G46	Fuel Pool Cooling and Cleanup	LRA-M-1088D LRA-M-1088E LRA-M-1089
G50	CRD Maintenance Facility, Flush Tank Filter and Leak Test	LRA-M-1050
M41	Containment Cooling	LRA-M-1100A LRA-M-1100B
M51	Drywell Cooling	LRA-M-1101
M61	Containment Leak Rate Test	LRA-M-1111A
N12	Auxiliary Steam	LRA-M-0036B LRA-M-0036C
P21	Makeup Water Treatment	LRA-M-0033A LRA-M-1061C LRA-M-0033B LRA-M-1061D LRA-M-0036B LRA-M-1063A
P33	Process Sampling	LRA-M-1069A LRA-M-1069C LRA-M-1069B LRA-M-1069D

System Code	System Name	LRA Drawings	
P41	Standby Service Water	LRA-M-1061A LRA-M-1061B	
P42	Component Cooling Water	LRA-M-1063A LRA-M-1063B	
P43	Turbine Building Cooling Water	LRA-M-1062A LRA-M-1062B LRA-M-1062C	
P44	Plant Service Water	LRA-M-1072A LRA-M-1072B LRA-M-1072D	LRA-M-1072E LRA-M-1072F
P45 P48	Floor and Equipment Drain	LRA-M-0041 LRA-M-1094A LRA-M-1094B LRA-M-1094C LRA-M-1094E LRA-M-1098A LRA-M-1098B	LRA-M-1098C LRA-M-1098D LRA-M-1098E LRA-M-1098F LRA-M-1098G LRA-M-1098H
P51 P52 P53	Compressed Air	LRA-M-1067A LRA-M-1067B LRA-M-1067D LRA-M-1067H	LRA-M-1068A LRA-M-1081A LRA-M-1081B
P60	Suppression Pool Cleanup	LRA-M-1099	
P64	Fire Protection	LRA-M-0035B LRA-M-0035L LRA-M-0035R	
P66	Domestic Water	LRA-M-0034A LRA-M-0034B	
P71	Plant Chilled Water	LRA-M-1109A LRA-M-1109B LRA-M-1109C	LRA-M-1109D LRA-M-1109E LRA-M-1109F
P72	Drywell Chilled Water	LRA-M-1072B LRA-M-1119A	
P75	Standby Diesel Generator	LRA-M-1070A LRA-M-1070B	LRA-M-1070C LRA-M-1070D

System Code	System Name	LRA Drawings	
P81	HPCS Diesel Generator	LRA-M-1061B LRA-M-1093A	LRA-M-1093B LRA-M-1093C
P87	NobleChem™ Injection and Monitoring	LRA-M-1127A	
T41	Auxiliary Building Ventilation	LRA-M-1103A	
T42	Fuel Handling Area Ventilation	LRA-M-1104A LRA-M-1104B	
U41	Turbine Building Ventilation	LRA-M-1105A LRA-M-1105C	
X77	Diesel Generator Building Ventilation	LRA-M-1106A	
Z17	Control Building HVAC	LRA-M-0050A LRA-M-0050B	
Y70 Z18	Sanitary Waste	LRA-M-0046	
Z51	Control Room HVAC	LRA-M-0049	
Z77	Emergency Switchgear and Battery Rooms Ventilation	LRA-M-1108A LRA-M-1108B	

**Table 2.3.3-1
Control Rod Drive System
Components Subject to Aging Management Review**

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Piping	Pressure boundary
Rupture disc	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-2
Standby Liquid Control System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Heater housing	Pressure boundary
Orifice	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

Table 2.3.3-3
Suppression Pool Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vortex breaker	Flow control

**Table 2.3.3-4
Leakage Detection and Control System
Components Subject to Aging Management Review**

Component Type	Intended Function
Blower housing	Pressure boundary
Bolting	Pressure boundary Filtration
Expansion joint	Pressure boundary
Flow element	Pressure boundary
Flow gauge	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-5
Combustible Gas Control System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Compressor inlet shroud	Pressure boundary
Filter housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Piping	Pressure boundary
Pump casing	Pressure boundary
Recombiner housing	Pressure boundary
Strainer	Filtration
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-6
Fuel Pool Cooling and Cleanup System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Diffuser	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Neutron absorber	Neutron absorption
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-7
Standby Service Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Detector housing	Pressure boundary
Flexible connection	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (tubes)	Heat transfer
Heat exchanger (tubes)	Pressure boundary
Nozzle	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

Table 2.3.3-8
Component Cooling Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-9
Plant Service 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
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-10
Floor and Equipment Drainage System
Components Subject to Aging Management Review

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

Table 2.3.3-11
Compressed Air System
Components Subject to Aging Management Review

Component Type	Intended Function
Accumulator	Pressure boundary
Air cylinder	Pressure boundary
Bolting	Pressure boundary
Compressor housing	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Flex connection	Pressure boundary
Flow element housing	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-12
Fire Protection – Water System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Breather vent	Filtration
Expansion joint	Pressure boundary
Flame arrestor	Flow control
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (housing)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Hose station	Pressure boundary
Muffler	Pressure boundary
Nozzle	Pressure boundary Flow control
Piping	Pressure boundary
Pump casing	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vortex breaker	Flow control

Table 2.3.3-13
Fire Protection – Halon and CO_2 System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Coil	Pressure boundary
Nozzle	Pressure boundary Flow control
Piping	Pressure boundary
Tank	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-14
Plant Chilled 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
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	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

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

Component Type	Intended Function
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Filter	Filtration
Filter housing	Pressure boundary
Flame arrestor	Flow control
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Heater housing	Pressure boundary
Orifice	Flow control
Piping	Pressure boundary
Pump casing	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

Table 2.3.3-16
HPCS 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	Filtration
Filter housing	Pressure boundary
Flame arrestor	Flow control
Flex connection	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (fins)	Heat transfer
Heat exchanger (housing)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Heater housing	Pressure boundary
Lubricator	Pressure boundary
Orifice	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

Table 2.3.3-16 (Continued)
HPCS Diesel Generator System
Components Subject to Aging Management Review

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

Table 2.3.3-17
Control Room HVAC System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Charcoal filter housing	Pressure boundary
Compressor housing	Pressure boundary
Damper housing	Pressure boundary
Demister housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Evaporator housing	Pressure boundary
Evaporator tube fins	Heat transfer
Evaporator tubes	Pressure boundary Heat transfer
Fan housing	Pressure boundary
Filter dryer housing	Pressure boundary
Filter train housing	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Heat exchanger (tube sheets)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Heater housing	Pressure boundary
HEPA filter housing	Pressure boundary
Humidifier housing	Pressure boundary
Muffler housing	Pressure boundary
Piping	Pressure boundary

**Table 2.3.3-17 (Continued)
Control Room HVAC System
Components Subject to Aging Management Review**

Component Type	Intended Function
Plenum housing	Pressure boundary
Prefilter housing	Pressure boundary
Sight glass	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-18
HVAC System
Components Subject to Aging Management Review

Component Type	Intended Function
Bolting	Pressure boundary
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (drain pan)	Pressure boundary
Heat exchanger (housing)	Pressure boundary
Heat exchanger (tubes)	Pressure boundary Heat transfer
Orifice	Pressure boundary Flow control
Piping	Pressure boundary
Strainer	Pressure boundary Filtration
Tubing	Pressure boundary
Valve body	Pressure boundary

Table 2.3.3-19-1
CRD Hydraulic 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
Flexible connection	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Sight glass	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 2.3.3-19-2
Standby Liquid Control 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
Orifice	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.

Table 2.3.3-19-3
Process Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flexible connection	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 2.3.3-19-4
Leak Detection 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
Flow element	Pressure boundary
Piping	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Thermowell	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 2.3.3-19-5
MSIV – Leakage Control 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
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 2.3.3-19-6
Combustible Gas Control 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
Duct	Pressure boundary
Filter housing	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	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 2.3.3-19-7
Reactor Water Cleanup 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
Expansion joint	Pressure boundary
Filter housing	Pressure boundary
Flexible connection	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
Rupture disc	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	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 2.3.3-19-8
Fuel Pool Cooling and Cleanup 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
Duct	Pressure boundary
Filter housing	Pressure boundary
Flexible connection	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
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 2.3.3-19-9
CRD Maintenance Facility, Flush Tank Filter and Leak Test 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
Orifice	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 2.3.3-19-10
Containment Cooling 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
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Heater housing	Pressure boundary
Piping	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 2.3.3-19-11
Drywell Cooling 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
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Piping	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 2.3.3-19-12
Containment Leak Rate Test 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
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 2.3.3-19-13
Auxiliary Steam 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
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 2.3.3-19-14
Makeup Water Treatment 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
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 2.3.3-19-15
Process Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Coil	Pressure boundary
Filter housing	Pressure boundary
Flexible connection	Pressure boundary
Flow element	Pressure boundary
Orifice	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 2.3.3-19-16
Standby Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flexible connection	Pressure boundary
Piping	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 2.3.3-19-17
Component Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flexible connection	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
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 2.3.3-19-18
Turbine Building Cooling 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
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 2.3.3-19-19
Plant Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Ejector	Pressure boundary
Flow element	Pressure boundary
Piping	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 2.3.3-19-20
Floor and Equipment Drainage 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
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	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 2.3.3-19-21
Compressed 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
Flow element	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.

Table 2.3.3-19-22
Suppression Pool Cleanup 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 2.3.3-19-23
Fire Protection 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
Nozzle	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 2.3.3-19-24
Domestic 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
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 2.3.3-19-25
Plant Chilled Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flexible connection	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 2.3.3-19-26
Drywell Chilled 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
Flexible connection	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 2.3.3-19-27
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
Pump casing	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 2.3.3-19-28
HPCS Diesel Generator 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
Flexible connection	Pressure boundary
Piping	Pressure boundary
Strainer housing	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 2.3.3-19-29
NobleChem™ Injection and Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function[a]
Bolting	Pressure boundary
Flexible connection	Pressure boundary
Flow element	Pressure boundary
Heat exchanger (shell)	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 2.3.3-19-30
Auxiliary Building Ventilation 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
Piping	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 2.3.3-19-31
Fuel Handling Area Ventilation 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
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Piping	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 2.3.3-19-32
Turbine Building Ventilation 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
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Piping	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 2.3.3-19-33
Diesel Generator Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Bolting	Pressure boundary
Duct	Pressure boundary
Piping	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 2.3.3-19-34
Control Building HVAC 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
Damper housing	Pressure boundary
Duct	Pressure boundary
Duct flexible connection	Pressure boundary
Fan housing	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Humidifier housing	Pressure boundary
Piping	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 2.3.3-19-35
Sanitary Waste 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
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 2.3.3-19-36
Control Room HVAC 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
Duct flexible connection	Pressure boundary
Fan Housing	Pressure boundary
Orifice	Pressure boundary
Piping	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 2.3.3-19-37
Emergency Switchgear and Battery Rooms Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function[a]
Duct	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, Condensate and Refueling Water Storage and Transfer
- Section 2.3.4.2, Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

2.3.4.1 Condensate and Refueling Water Storage and Transfer

System Description

This review of the condensate and refueling water storage and transfer system includes system code C61, the remote shutdown system, as well as system code P11, the condensate and refueling water storage and transfer system.

Condensate and Refueling Water Storage and Transfer

The purpose of the condensate and refueling water storage and transfer (CRWST) system (system code P11) is to pump and store condensate for the RCIC and HPCS systems, maintain the level of condensate in the condenser hotwell, provide condensate to other plant systems, where required, and handle water during refueling and fuel shipping cask loading operations. The CRWST includes the condensate storage and transfer subsystem and the refueling water storage and transfer subsystem.

The condensate storage and transfer subsystem consists of a stainless steel storage tank with a capacity of 300,000 gallons, two condensate transfer pumps, and necessary piping, valves, and instrumentation. The condensate storage tank is the preferred water source for the HPCS and RCIC pumps during emergency conditions, including station blackout, and for normal testing; however, the suppression pool is the credited safety-grade water source for emergency conditions.

The condensate storage and transfer subsystem also provides makeup to the fuel pool cooling and cleanup system, liquid radwaste system, reactor water cleanup system, and control rod drive hydraulic system. The condensate and refueling water storage and transfer system will provide fire water to the fire protection system inside the containment, as required. The primary source of makeup to the condensate storage tank is the liquid radwaste system effluent. One pump continuously operates during normal plant operation.

The refueling water storage and transfer subsystem consists of a stainless steel refueling water storage tank (RWST) with a capacity of 350,000 gallons, two refueling water transfer pumps, and necessary piping, valves, and instrumentation. This subsystem provides the water handling requirements for the upper containment pool during refueling and for the cask storage pool during cask loading. The RWST is normally empty. This subsystem also provides water handling requirements for the suppression pool cleanup system during normal plant operation. During normal plant operation one or both of the refueling water transfer pumps takes suction from the suppression pool and transfers the water to the suppression pool cleanup system.

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

- Support automatic transfer of HPCS and RCIC pump suction to the suppression pool on low CST level.
- Support containment pressure boundary.

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

- Perform a function (fire water to containment) 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).

Remote Shutdown System

The purpose of the remote shutdown system (system code C61) is to provide the necessary controls and instrumentation for reactor systems and secondary support systems to shutdown the reactor from outside the main control room. Remote shutdown controls and instrumentation are located on two panels. Each panel contains control and instrumentation of systems powered from either the ESF Division 1 or Division 2 buses.

The system is comprised primarily of EIC equipment; however it includes one mechanical component, a level transmitter isolation valve off the RCIC and HPCS pump suction line from the CST. This valve supports the CST level indication.

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

- Support automatic transfer of HPCS and RCIC pump suction to the suppression pool on low CST level.

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

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

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

UFSAR References

CRWST	*Remote Shutdown*
Section 9.2.6	Section 7.4.1.4
Section 9.5.1	Section 7.4.1.5
Appendix 8A	

Components Subject to Aging Management Review

Nonsafety-related components of the CRWST system whose failure could prevent satisfactory accomplishment of safety functions not reviewed in other sections are reviewed in Section 2.3.4.2, 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-M-0035B	LRA-M-1085B
LRA-M-1065	LRA-M-1085C
LRA-M-1083A	LRA-M-1086
LRA-M-1085A	LRA-M-1087

2.3.4.2 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 GGNS, certain components and piping outside the safety class pressure boundary must be structurally sound in order 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 this review. 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 Code	System Name	Section Describing System
C34	Feedwater Control	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N11	Main and Reheat Steam	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N19 N21	Condensate and Feedwater	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N22	Condensate Cleanup	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N23	Heater Vents and Drains	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N30–N32	Main Turbine and Auxiliaries	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N33	Main and Reactor Feedpump Turbine Seal Steam and Drain	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N34	Lube Oil	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N35	Moisture Separator-Reheater Vents and Drains	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

System Code	System Name	Section Describing System
N36	Extraction Steam	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N37	Turbine Bypass	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N41	Generator	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N42	Seal Oil	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N43	Generator Primary Water	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N51	Excitation	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N62	Condenser Air Removal	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N64 N65	Low Temperature Offgas	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
N71	Circulating Water	Section 2.3.4.2, Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)
P11	Condensate and Refueling Water Storage and Transfer System	Section 2.3.4.1, Condensate and Refueling Water Storage and Transfer

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 2.3.2.7, Containment Penetrations for primary containment penetrations). None of these systems has an intended function for 10 CFR 54.4(a)(3).

Feedwater Control

The purpose of the feedwater control system (system code C34) is to automatically control the flow of feedwater into the reactor pressure vessel to maintain the water within the vessel at predetermined levels. The system includes a small number of nonsafety-related valves and piping components in the turbine building that support feedwater pressure and flow instruments.

UFSAR Reference: Section 7.7.2.4

Main and Reheat Steam

The purpose of the main and reheat steam (MRS) system (system code N11) is to deliver main steam from the reactor to the main turbine and supporting equipment. The system also delivers steam to the reactor feed pump turbines. The system includes piping and valves downstream of the main steam isolation valves to the main stop and control valves, high pressure turbine moisture separator reheaters, low pressure turbine control and stop valves, and low pressure turbines. The system also includes piping and valves to distribute main and reheat steam to other equipment, such as the steam jet air ejectors and the turbine bypass system.

The system includes safety-related instrument piping from the four main steam lines and from the turbine first stage inlet piping to safety-related pressure instruments in the nuclear boiler system, CRD hydraulic system and reactor protection system. With the exception of this piping, the MRS system is nonsafety-related. The safety-related instrument piping from the four main steam lines supports pressure transmitters of the nuclear boiler system that provide input to the containment and reactor vessel isolation control system (CRVICS). On low steam line pressure CRVICS isolates the steam lines and steam line drains. This isolation function is not required to satisfy any of the safety design bases for this system. Since the pressure boundary of the safety-related piping need not be maintained to complete this function, and since the function is not required for plant safety, this piping does not support a system intended function and is therefore not subject to aging management review. The safety-related instrument piping from the turbine first stage inlet piping to safety-related pressure instruments in the CRD hydraulic system and reactor protection system is subject to aging management review.

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

- Support safety-related pressure instrumentation.

UFSAR Reference: Section 10.3, Section 7.3.1.1.2.4.1.5

The piping supporting the safety-related pressure instrumentation is reviewed in Section 2.3.3.1, Control Rod Drive.

Condensate and Feedwater

The purpose of the condensate and feedwater system is to provide a dependable supply of feedwater to the reactor, to provide feedwater heating, and to maintain high water quality in the feedwater. The condensate (system code N19) and feedwater (system code N21) system consists of the piping, valves, pumps, heat exchangers, controls, instrumentation, and the associated equipment and subsystems which supply the reactor with heated feedwater in a closed steam cycle utilizing regenerative feedwater heating. The system extends from the main condenser to the auxiliary building. The remainder of the system extending to the reactor, including components of the containment pressure boundary and the reactor coolant pressure boundary, is part of the nuclear boiler system (system code B21). The condensate and feedwater system serves no safety function.

The main portion of the feedwater flow is condensate pumped from the main condenser. The remaining portion, which comes from the moisture separator drains, steam reheater drains, and drains from the fifth and sixth stage feedwater heaters, is pumped forward from the fifth stage of heating into the feedwater stream. Turbine extraction steam is used for a total of six stages of closed feedwater heating.

The condensate pumps take the deaerated condensate from the condenser shell hotwell and deliver it to the demineralizers of the condensate cleanup system (system code N22). From the demineralizers, condensate then flows to the condensate booster pumps which discharge successively through the first four feedwater heater stages and then to the reactor feed pumps. The remainder of the feedwater flow, provided by the drains, is injected into the feedwater stream between the fourth-stage feedwater heaters and the reactor feed pumps. The reactor feed pumps then discharge the total feedwater flow through the fifth and sixth stage high-pressure feedwater heaters and then to the reactor.

UFSAR Reference: Section 10.4.7

Condensate Cleanup

The purpose of the condensate cleanup system (system code N22) is to maintain the required purity of feedwater flowing to the reactor. Normally, demineralizers are in operation processing full condensate flow. The condensate cleanup system consists of eight units of deep-bed-type demineralizers (with two units as spares) that operate in parallel, and three precoat filters (with one unit as spare) used for startup. The system also includes the associated piping, ultrasonic resin cleaner, the advanced resin cleaning subsystem, and all necessary valves, instrumentation and controls.

UFSAR Reference: Section 1.2.2.5.9, Section 10.4.6

Heater Vents and Drains

The purpose of the heater vents and drains system (system code N23) is to process condensate and non-condensable gases in the shell side of the six stages of feedwater heaters. The heater vents and drains system serves no safety function.

The startup and operating vents from the steam side of the feedwater heaters are piped directly to the main condenser. The drains from the fourth and third stages of feedwater heaters cascade to the second stage feedwater heaters. The first and second stages of the heaters drain independently to the main condenser. A single heater drain tank receives drains directly from the shells of the fifth and sixth stage feedwater heaters, the moisture separator drain tanks, the moisture separator shell drain tanks, and the first stage steam reheater drain tanks. The heater drain tank provides deaeration to limit the oxygen content in the pumped-forward drain flow and provides reservoir capacity for drain pumping. Two half-capacity heater drain pumps operate in parallel, taking suction from the heater drain tank and discharging to the feedwater stream on the suction side of the reactor feed pumps.

UFSAR Reference: Section 10.3, Section 10.4.7.2

Main Turbine and Auxiliaries

The purpose of the main turbine and its auxiliaries (system codes N30–N32) is to convert thermal energy from steam supplied by the nuclear boiler system into mechanical energy to drive the main electrical generator. The steam turbine is an 1800-rpm, tandem-compound, six-flow, reheat unit with electrohydraulic control (EHC) for normal operation. The main turbine, turbine control valves and the EHC system comprise system codes N30 (Turbine and Auxiliaries), N31 (Turbine) and N32 (Turbine Control System). The main turbine and auxiliaries serve no safety function.

The main turbine includes one double-flow, high-pressure turbine and three double-flow, low-pressure turbines. Steam enters the power conversion system in four main steam lines and flows to the four high-pressure stop and control valves of the main turbine generator. Exhaust steam from the high-pressure turbine passes through two combined moisture separator and two-stage reheaters (system code N35) before entering the three low-pressure turbines.

There is one extraction point for steam as it passes through the high-pressure turbine. This high-pressure extraction steam is used for the first-stage reheating of the steam to the low-pressure turbines and for feedwater heating. There are four extraction points in the low-pressure turbines supplying steam used as the heating supply to the first four stages of feedwater heating.

The turbine generator uses an EHC system which controls the speed, load, and main steam pressure for startup and planned operations. The turbine trip system trips the unit when required. The EHC, the turbine trip, and the bypass control system operate the main stop and control valves, low pressure turbine stop and control valves, bypass stop and control valves, and other protective devices. The reactor protection system (RPS) has safety-related pressure transmitters that monitor EHC hydraulic fluid pressure to sense closure of the turbine control and stop valves. These transmitters sense valve closure when the hydraulic pressure decreases. Therefore, the pressure boundary of the safety-related sensing lines from the EHC to the RPS transmitters need not be maintained for the RPS to perform its safety function. Since the pressure boundary of the sensing lines need not be maintained to complete this function, the sensing lines do not support a system intended function and are therefore not subject to aging management review.

UFSAR Reference: Section 10.2, Section 7.2.1.1.4.2

Main and Reactor Feedpump Turbine Seal Steam and Drain

The purpose of the main and reactor feedpump (RFP) turbine seal steam (system code N33) and drain system (referred to as the turbine gland sealing system in the UFSAR) is to prevent air leakage into and radioactive steam leakage out of the main and RFP turbines, combined main and RFP stop and control valves, low pressure (LP) stop and control valves, and combined bypass stop and control valves. The turbine gland sealing system provides the means of sealing the main and RFP turbine shaft glands and valve stems (main stop and control, LP turbine stop and control, and bypass valves) with non-radioactive steam. The turbine gland sealing system serves no safety function.

The turbine gland sealing system consists of a non-radioactive auxiliary steam source, a separate seal steam generator, seal steam pressure regulators, seal steam header, one full-capacity seal steam condenser, two full-capacity seal steam condensers exhausters, and the associated piping, valves, controls, and instrumentation. Non-radioactive sealing steam for the RFP turbine shaft glands, RFP turbine stop and control valves, and the main turbine shaft glands and valve stem glands (stop, control, and bypass valves) is supplied from the seal steam header. The source of non-radioactive sealing steam is a separate seal steam generator during normal plant operation. The outer ends of all glands and valve stems are routed to the seal steam condenser, which is maintained at a slight vacuum by the exhauster. The condensed steam from the sealing system is returned to the main condenser, and the non-condensable gases entrained with the condensed steam are exhausted to the turbine building vent stack.

UFSAR Reference: Section 10.4.3

Lube Oil

The purpose of the lube oil system (system code N34) is to purify lube oil in the main turbine and reactor feed pump turbine (RFPT) reservoirs and to lubricate and cool the bearings of the turbine generator, exciter, and turbine main oil pump. The lube oil system includes two subsystems, the turbine lube oil system and the lube oil conditioning and transfer system. The lube oil system serves no safety function.

The turbine lube oil system consists of a reservoir, coolers, and various pumps to supply lubricating oil at the proper temperature, pressure and flow to the main turbine and generator bearings. The pumps take a suction on the turbine lube oil reservoir and deliver the oil to the bearings through one of two lube oil coolers.

The lube oil storage and transfer system is comprised of conditioning equipment, pumps, valves and piping required to continuously purify the lube oil in the main and RFPT lube oil reservoirs. The lube oil storage tanks allow oil reservoir replenishment or draining, as required. Lube oil can be transferred throughout the system by use of the lube oil transfer pump.

UFSAR Reference: None

Moisture Separator-Reheater Vents and Drains

The purpose of the moisture separator-reheater (MSR) vents and drains system (system code N35) is to dry and reheat the high pressure turbine exhaust steam before it passes to the low pressure turbines, and to process the collected moisture. The system includes the moisture separator reheaters, moisture separator shell side and reheater (tube) side drain tanks, piping, valves, instruments and controls. The moisture separator-reheater vents and drains system serves no safety function.

High pressure (HP) turbine exhaust steam enters the shell side of the MSRs where entrained moisture collects and drains to the moisture separator shell drain tanks. Two stages of reheat are provided using steam extracted from the HP turbine and steam chest. Condensate from the reheat steam is collected in separate drain tanks. Both the shell side and reheater side drain tanks drain to the heater drain tank.

UFSAR Reference: Sections 10.2, 10.3, 10.4

Extraction Steam

The purpose of the extraction steam system (system code N36) is to provide steam, extracted from various stages of the high and low pressure turbines, as a source of heat to improve the efficiency of the power conversion cycle. Steam is extracted from the high pressure turbine for use in the moisture separator reheaters and high pressure feedwater heaters. Steam extracted from the low pressure turbines provides heat for the low pressure feedwater heaters.

The extraction steam system includes piping, valves, instruments and controls used to distribute the steam. The extraction steam system serves no safety function.

UFSAR Reference: Sections 10.2, 10.3, 10.4

Turbine Bypass

The purpose of the turbine bypass system (system code N47) is to control reactor pressure when the turbine cannot regulate reactor pressure. The turbine bypass valves are opened to pass steam directly to the condenser when the turbine cannot accept some or all of the steam produced by the reactor; for example, during reactor heat-up to rated pressure while the turbine is being brought up to speed and synchronized, during power operation when the reactor steam generation exceeds the transient turbine steam requirements, or during cool down of the reactor. The turbine bypass system serves no safety function.

The turbine bypass system consists of three hydraulically operated combined stop and control valves which are mounted separately on each bypass to the condenser. They are operated automatically and in parallel. The first bypass valve leads the other two by 10 percent. The remaining valves operate in parallel. The bypass piping is connected to the main steam lines upstream of the turbine main stop valves. Each bypass valve outlet is piped directly to the main condenser, and a pressure breakdown assembly using a water spray is located at each condenser connection.

UFSAR Reference: Section 10.4.4

Generator

The purpose of the generator system (system code N41) is to convert mechanical energy from the turbine into electrical energy. The system includes the main generator rotor, stator, instruments and controls. Although most system components are electrical, there are some mechanical components in the system, such as valves associated with the generator hydrogen dew point monitor and the bearing fan housings. The system serves no safety function.

UFSAR Reference: None

Seal Oil

The purpose of the generator seal oil system (system code N42) is to maintain a barrier between the hydrogen inside the generator and the air outside the generator to prevent possible explosive mixtures and dirt contamination in the generator internals. The system also provides lubrication to the main generator stator seals. The system serves no safety function.

Pressurized oil is supplied to the generator shaft seals to keep air from entering the generator and hydrogen from escaping. The seals are supplied with oil from two seal oil circuits, each including tanks, pumps, regulating valves, coolers, filters, piping, instruments and controls.

UFSAR Reference: None

Generator Primary Water

The purpose of the generator primary water system (also referred to as the generator cooling system) (system code N43) is to provide water to cool the main generator stator, rotor, and each of the three bushing circuits at all generator loads. The generator primary water system circulates cooling water in a closed loop and dissipates the absorbed heat to the turbine building cooling water (TBCW) system. The system serves no safety function.

The basic system consists of a head tank; a main shaft-driven pump; six TBCW-cooled heat exchangers; water purification equipment; filters; piping connections to the generator rotor, stator, and phase bushings; and necessary valves, instruments and controls. The main cooling loop flowpath driving head is provided by a generator shaft-driven primary water pump, located in the primary water supply unit.

UFSAR Reference: None

Excitation

The purpose of the excitation system (system code N51) is to provide excitation power to the main generator. The generator exciter system is a brushless, rotating, rectifier type. The exciter is coupled to the outboard end of the generator and includes a permanent-magnet pilot exciter which energizes the field of the main exciter through a voltage regulator. The rectified output of the main exciter is delivered to the generator field winding through conductors built into a central bore in the exciter end of the generator shaft. The exciter is cooled by air circulated within its housing by a shaft-mounted blower. The heat is rejected in an air-to-water heat exchanger in the housing. The excitation system serves no safety function.

UFSAR Reference: Section 10.2.2.2

Condenser Air Removal

The purpose of the condenser air removal system (system code N62) is to create and maintain a vacuum in the main condenser during startup and power generation. The condenser air removal system removes the non-condensable gases from the main condenser, including air in-leakage and dissociation products originating in the reactor, and exhausts them to the gaseous radwaste system. The condenser air removal system serves no safety function.

The condenser air removal system consists of two full-capacity, single element, two stage, steam-jet air ejector units with inter-condensers. The two stages of the steam jet air ejector units are used for normal plant operation. Main steam is supplied as the driving medium to the two-stage air ejectors. The first stage takes suction from the main condenser and exhausts the gas/vapor mixture to the inter-condenser. The second stage takes suction from the inter-condenser and exhausts the gas/vapor mixture to the gaseous radwaste system. The resulting condensate from the air ejector condenser is drained back to the main condenser.

Three one-third capacity mechanical vacuum pumps are used during startup when the desired rate of air and gas removal exceeds the capacity of the steam jet air ejectors. The discharge from the vacuum pumps is routed to the turbine building ventilation system.

UFSAR Reference: Section 10.4.2

Low Temperature Offgas

The purpose of the low temperature offgas system, or simply the offgas system, is to collect and isolate radioactive noble gases, airborne halogens, and particulates and to reduce their activity through decay. The offgas from the main condenser steam-jet air ejector is treated by means of a system using catalytic recombination and low-temperature charcoal adsorption. The system is not credited for post-accident dose reduction and serves no safety function.

The offgas system uses a catalytic recombiner to recombine radiolytically dissociated hydrogen and oxygen. After cooling to strip the condensables and reduce the volume, the remaining non-condensables (principally air with traces of krypton and xenon) will be delayed in the ten-minute holdup system. The gas is cooled and filtered through a

HEPA filter. The gas is then passed through a desiccant dryer that reduces the dewpoint, and is then chilled. Charcoal adsorption beds, operating in a refrigerated vault at about 0°F, selectively adsorb and delay xenon and krypton from the bulk carrier gas (principally dry air). After the delay, the gas is again passed through a HEPA filter and discharged to the environment through the plant vent.

The low temperature offgas system includes both the offgas system (system code N64) and the offgas vault refrigeration system (system code N65). The offgas system includes the process flowpath equipment. The offgas vault refrigeration system supports the offgas system by cooling the shielded vaults containing the charcoal beds to low temperatures.

The offgas system includes catalytic recombiners, activated charcoal adsorber beds, the offgas holdup line, heaters, coolers, condensers, filters, piping, valves, instruments and controls. The major equipment of the offgas vault refrigeration system consists of two full-capacity refrigerating units and the associated ductwork and piping.

UFSAR Reference: Section 11.3

Circulating Water

The purpose of the circulating water system (system code N71) is to provide the main condenser with a continuous supply of cooling water to remove the heat rejected from the cycle. The circulating water system is a closed system using a natural draft cooling tower and a mechanical draft auxiliary cooling tower. Two vertical motor-driven pumps circulate the cooling water from the cooling tower basin through the main condenser and then back to the cooling towers. Makeup water, to compensate for drift, blowdown, and evaporation losses, is supplied from the plant service water system. The circulating water system serves no safety function.

UFSAR Reference: Section 10.4.5

UFSAR References

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

System Code	System	UFSAR Reference
C34	Feedwater Control	Section 7.7.2.4
N11	Main and Reheat Steam	Section 10.3 Section 7.3.1.1.2.4.1.5
N19, N21	Condensate and Feedwater	Section 10.4.7
N22	Condensate Cleanup	Section 1.2.2.5.9 Section 10.4.6
N23	Heater Vents and Drains	Section 10.3 Section 10.4.7.2
N30–N32	Main Turbine and Auxiliaries	Section 10.2 Section 7.2.1.1.4.2
N33	Main and Reactor Feedpump Turbine Seal Steam and Drain	Section 10.4.3
N34	Lube Oil	None
N35	Moisture Separator-Reheater Vents and Drains	Section 10.2 Section 10.3 Section 10.4
N36	Extraction Steam	Section 10.2 Section 10.3 Section 10.4
N37	Turbine Bypass	Section 10.4.4
N41	Generator	None
N42	Seal Oil	None
N43	Generator Primary Water	None
N51	Excitation	Section 10.2.2.2
N62	Condenser Air Removal	Section 10.4.2
N64, N65	Low Temperature Off Gas	Section 11.3
N71	Circulating Water	Section 10.4.5

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).

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 2.3.4-2-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 3.4.2-2-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 Code	System	Component Types	AMR Results
C34	Feedwater Control	Table 2.3.4-2-1	Table 3.4.2-2-1
N11	Main and Reheat Steam	Table 2.3.4-2-2	Table 3.4.2-2-2
N19 N21	Condensate and Feedwater	Table 2.3.4-2-3	Table 3.4.2-2-3
N22	Condensate Cleanup	Table 2.3.4-2-4	Table 3.4.2-2-4
N23	Heater Vents and Drains	Table 2.3.4-2-5	Table 3.4.2-2-5
N30– N32	Main Turbine and Auxiliaries	Table 2.3.4-2-6	Table 3.4.2-2-6
N33	Main and Reactor Feedpump Turbine Seal Steam and Drain	Table 2.3.4-2-7	Table 3.4.2-2-7
N34	Lube Oil	Table 2.3.4-2-8	Table 3.4.2-2-8
N35	Moisture Separator-Reheater Vents and Drains	Table 2.3.4-2-9	Table 3.4.2-2-9
N36	Extraction Steam	Table 2.3.4-2-10	Table 3.4.2-2-10
N37	Turbine Bypass	Table 2.3.4-2-11	Table 3.4.2-2-11
N41	Generator	Table 2.3.4-2-12	Table 3.4.2-2-12
N42	Seal Oil	Table 2.3.4-2-13	Table 3.4.2-2-13
N43	Generator Primary Water	Table 2.3.4-2-14	Table 3.4.2-2-14
N51	Excitation	Table 2.3.4-2-15	Table 3.4.2-2-15
N62	Condenser Air Removal	Table 2.3.4-2-16	Table 3.4.2-2-16
N64 N65	Low Temperature Off Gas	Table 2.3.4-2-17	Table 3.4.2-2-17
N71	Circulating Water	Table 2.3.4-2-18	Table 3.4.2-2-18
P11	Condensate and Refueling Water Storage and Transfer System	Table 2.3.4-2-19	Table 3.4.2-2-19

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	
C34	Feedwater Control	LRA-M-1054	
N11	Main and Reheat Steam	LRA-M-1051A LRA-M-1051B	LRA-M-1051C LRA-M-1051D
N19 N21	Condensate and Feedwater	LRA-M-1051B LRA-M-1053A LRA-M-1053B LRA-M-1053C LRA-M-1053D	LRA-M-1053E LRA-M-1054 LRA-M-1066B SH01 LRA-M-1066B SH02
N22	Condensate Cleanup	LRA-M-1064C LRA-M-1064D LRA-M-1064E LRA-M-1064F	LRA-M-1064G LRA-M-1064H LRA-M-1064J
N23	Heater, Vents, and Drains	LRA-M-1055A LRA-M-1055B LRA-M-1055C	LRA-M-1055D LRA-M-1055E
N30– N32	Main Turbine and Auxiliaries	LRA-M-1051A LRA-M-1051C LRA-M-1116A LRA-M-1117A LRA-M-1117B LRA-M-1117C	LRA-M-1117D LRA-M-1117E LRA-M-1117F LRA-M1117G LRA-M-1117H LRA-M-1117J
N33	Main and Reactor Feedpump Turbine Seal Steam and Drain	LRA-M-1057A LRA-M-1057B	
N34	Lube Oil	LRA-M-1066A LRA-M-1066B SH01 LRA-M-1066B SH02 LRA-M-1066C	LRA-M-1066E LRA-M-1116A LRA-M-1116B
N35	Moisture Separator-Reheater Vents and Drains	LRA-M-1056A LRA-M-1056B	
N36	Extraction Steam	LRA-M-1052	

System Code	System	LRA Drawings	
N37	Turbine Bypass	LRA-M-1051C LRA-M-1053A	LRA-M-1053B LRA-M-1117D
N41	Generator	LRA-M-1066A LRA-M-1122A	
N42	Seal Oil	LRA-M-1116A LRA-M-1116B LRA-M-1121	
N43	Generator Primary Water	LRA-M-1044A LRA-M-1062C LRA-M-1116A LRA-M-1116B	LRA-M-1120A LRA-M-1120B LRA-M-1122A
N51	Excitation	LRA-M-1062C	
N62	Condenser Air Removal	LRA-M-1060A LRA-M-1060B LRA-M-1072A	
N64 N65	Low Temperature Off Gas	LRA-M-1092A LRA-M-1062C	
N71	Circulating Water	LRA-M-1059A LRA-M-1059B LRA-M-1059C	
P11	Condensate and Refueling Water Storage and Transfer System	LRA-M-1065	

Table 2.3.4-1
Condensate and Refueling Water Storage and Transfer System
Components Subject to Aging Management Review

Component Type	Intended Function(s)
Accumulator	Pressure boundary
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	Pressure boundary
Pump casing	Pressure boundary
Rupture disc	Pressure boundary
Strainer	Filtration
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	Pressure boundary
Tubing	Pressure boundary
Valve body	Pressure boundary
Vortex breaker	Flow control

Table 2.3.4-2-1
Feedwater Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Piping	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 2.3.4-2-2
Main and Reheat Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Rupture disc	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 2.3.4-2-3
Condensate and Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Accumulator	Pressure boundary
Bolting	Pressure boundary
Duct	Pressure boundary
Expansion joint	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
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	Pressure boundary
Tank	Pressure boundary
Thermowell	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 2.3.4-2-4
Condensate Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Accumulator	Pressure boundary
Bolting	Pressure boundary
Demineralizer	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
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 2.3.4-2-5
Heater, Vents, and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Expansion joint	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
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 2.3.4-2-6
Main Turbine and Auxiliaries
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Accumulator	Pressure boundary
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Tank	Pressure boundary
Thermowell	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 2.3.4-2-7
Main and RFP Turbine Seal Steam and Drain System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Duct	Pressure boundary
Flexible connection	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
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 2.3.4-2-8
Lube Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Accumulator	Pressure boundary
Blower housing	Pressure boundary
Bolting	Pressure boundary
Filter housing	Pressure boundary
Flexible connection	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	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 2.3.4-2-9
Moisture Separator-Reheater Vents and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Flow element	Pressure boundary
Orifice	Pressure boundary
Piping	Pressure boundary
Separator	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 2.3.4-2-10
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review**

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Expansion joint	Pressure boundary
Orifice	Pressure boundary
Piping	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 2.3.4-2-11
Turbine Bypass System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Orifice	Pressure boundary
Piping	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 2.3.4-2-12
Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Fan housing	Pressure boundary
Piping	Pressure boundary
Sight glass	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 2.3.4-2-13
Seal Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Filter housing	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	Pressure boundary
Orifice	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 2.3.4-2-14
Generator Primary Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Demineralizer	Pressure boundary
Filter housing	Pressure boundary
Flexible connection	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
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 2.3.4-2-15
Excitation System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Heat exchanger (bonnet)	Pressure boundary
Heat exchanger (shell)	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 2.3.4-2-16
Condenser Air Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	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
Separator	Pressure boundary
Sight glass	Pressure boundary
Strainer housing	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 2.3.4-2-17
Low Temperature Off Gas System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Heat exchanger (bonnet)	Pressure boundary
Piping	Pressure boundary
Separator	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 2.3.4-2-18
Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Expansion joint	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
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 2.3.4-2-19
Condensate and Refueling Water Storage and Transfer System
Nonsafety-Related Components Affecting Safety-Related Systems
Components Subject to Aging Management Review

Component Type	Intended Function(s)[a]
Bolting	Pressure boundary
Expansion joint	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.

2.4 SCOPING AND SCREENING RESULTS: STRUCTURES

The following structures and structural components are within the scope of license renewal.

- Section 2.4.1, Containment Building
- Section 2.4.2, Water Control Structures
- Section 2.4.3, Turbine Building, Process Facilities and Yard Structures
- Section 2.4.4, Bulk Commodities

2.4.1 Containment Building

Description

The purpose of the Mark III containment structure is to serve as both a biological shield and a pressure container during a loss of coolant accident or steam line break accident. The containment structure as well as all penetrations and the interior structures are seismic Category I structures. The containment building totally encloses the primary nuclear system and includes the enclosure building, drywell, suppression pool and weir wall, the refueling and reactor servicing areas, and other reactor auxiliary systems. These different structures and commodities of the containment will be addressed individually.

Containment

The containment building consists of a foundation mat, right circular cylinder and a hemispherical dome. The containment cylindrical wall, dome, and foundation mat are constructed of reinforced concrete. The containment wall, dome, and associated internal structures are founded on the mat foundation. The internal surface of the containment is lined with welded steel plate to form a leak-tight barrier. Above elevation 117' the liner is carbon steel plate, and below this elevation stainless steel plate material is used. A leak chase channel system is provided at seam welds that are inaccessible to allow inspection during plant operation. The containment base mat liner is fabricated from stainless steel plate. The containment wall and foundation mat are separated from the auxiliary building by a 2-inch gap, filled with a compressible joint filler material, to preclude significant interaction of these structures during seismic disturbances. Waterstops are provided on the outside of the wall around the containment perimeter and mate with the auxiliary building walls so as to contain radioactive or nonradioactive water. Missile protection is provided within the containment structure for internally generated missiles, such as from rotating equipment or pressurized component failure.

The containment provides support for the reactor pressure vessel (RPV) support pedestal. This support is a vertical, reinforced concrete, circular cylinder located directly beneath the RPV and the shield wall. The pedestal also supports the upper and lower control rod drive (CRD) support platforms, the CRD removal platform, pipe whip restraints, pipe hangers, and snubbers. The reactor pedestal is rigidly connected to the reinforced concrete base mat and the outside face of the mat is covered with a stainless steel clad, carbon steel liner plate which also serves as the lower extension of the weir wall forming the interior boundary of the suppression pool directly opposite the suppression pool vents. The outside edge of the pedestal mat acts as the base of the weir wall. Support for the reactor vessel consists of a welded steel plate ring girder anchored to the reactor pedestal.

The reactor shield wall surrounds the RPV and rests on the reactor pedestal. Both surfaces of the wall are lined with a carbon steel plate filled with high density concrete for shielding. This wall also supports steel floors at elevation levels 147'-7" and 161'-10" and provides missile protection.

The middle and lower pipe penetrations through the shield wall are equipped with shield plugs (except where flow diverters are provided) for inservice inspection. Flow diverters in the shield wall penetration are provided to minimize loads associated with annulus pressurization in the unlikely event of a pipe break.

The upper containment pool is used for interim storage and cooling of spent fuel assemblies and defective fuel storage containers (with fuel) during refueling operations. High density stainless steel spent fuel racks are installed in the upper containment fuel pool for this purpose. However, no fuel is contained in the upper containment fuel pool during normal power operation of the plant.

Penetrations which intersect the containment wall include the equipment hatch and two personnel locks. During normal operations the drywell equipment hatch is part of the drywell pressure retention boundary and is fitted with compression seals around its periphery to maintain its leak tightness along the mating surfaces. The doors on the personnel air lock are fitted with inflatable rubber seals to ensure the leak tightness of the lock.

The main steam pipe tunnel provides shielding for process piping and provides access for this piping to the auxiliary building steam tunnel. The main steam and feedwater lines are enclosed within steel guard pipes in this room, providing protection during a design bases event. The main steam tunnel is a reinforced concrete structure cantilevered from the drywell wall.

The containment polar crane is designed as seismic Category I equipment. The crane consists of two crane girders and a trolley. The circular runway (rails) which supports the crane girders is supported from the containment walls. The containment polar crane is used to move the reactor vessel head, shroud head and separator, and dryer assembly as required by operations. The containment hatchway crane is a general service crane located on the containment refueling floor. The crane is a base-mounted hydraulic telescoping crane attached to the structural steel floor. The crane handles loads in the hatchway area over the containment and drywell equipment hatches.

Enclosure Building

The enclosure building completely encloses the portions of the containment above the auxiliary building roof levels, and a flexible seal around the entire periphery of the enclosure/auxiliary building interface maintains leakage limits. The enclosure building and auxiliary building are combined to form a secondary containment to provide a controlled environment in which radiation leakage from the primary containment can be collected, filtered, and released to the atmosphere in a controlled manner. The enclosure building is a steel-framed, seismic Category I structure with uninsulated metal siding and insulated roof deck. The enclosure building is designed so that most of the siding can become detached during high tornado winds, which completely vents the building; however, the main structural framing is designed to remain in place. The building is founded on the dome and wall of the containment and is anchored to steel embedded plates and concrete piers. Struts founded on the containment shell support the structural steel frame, and an internal inspection platform allows access around the periphery of the building.

Drywell

The drywell is a reinforced concrete structure with a concrete foundation common to the containment foundation. The cylindrical walls of the drywell are subdivided into two structural components, a lower wall and an upper wall. The lower wall has two stiffened steel surface plates penetrated by steel vents. The annulus between the surface plates is concrete and the lower portion is supported by and anchored to the containment base slab. The lower steel portion is integrally connected with the upper wall. The upper wall is a reinforced concrete cylinder supported by the steel of the lower wall section and its internal concrete. A reinforced concrete roof contains a circular opening for the drywell head. The head, which is part of the drywell pressure retention boundary, is equipped with a pair of horizontal mating flanges. The lower flange is equipped with two compression seals. The drywell head, constructed of stainless steel, is located directly over the reactor pressure vessel. The drywell liner plate, which forms the suppression pool walls, is a stainless steel clad carbon steel plate.

Drywell electrical penetrations provide passage for electrical cables through the drywell wall. These penetrations are not part of the fission product barrier; however, they must be of sufficient leak tightness so that the overall drywell design basis leakage is not exceeded. To meet this objective, each electrical penetration consists of steel conduit, not larger than 6 inches in diameter, with a single fitting. After cable installation, this fitting is filled with a compound which will solidify in the seal chamber and prevent an exchange of atmosphere between the containment and the drywell. Mechanical and control penetrations are also provided and designed to be leak tight. Personnel air lock and equipment hatch openings penetrate the drywell cylindrical wall. Each of the two doors on the personnel air lock is fitted with two inflatable rubber seals to ensure the leak tightness of the lock. The equipment hatch is designed to be removed during plant maintenance. During normal plant operation the drywell equipment hatch is part of the drywell pressure retention boundary and as such uses two compression seals around its periphery to maintain its leak tightness along the mating surfaces.

Suppression Pool and Weir Wall

The suppression pool serves as a heat sink during normal operational transients and accident conditions. The suppression pool area of the containment liner is stainless steel and serves as the fission product barrier. A reinforced concrete slab cantilevered over the suppression pool provides support for the traversing incore probe (TIP) station. This reinforced concrete slab has a steel box structure that projects beneath the slab into the suppression pool. The weir wall is a vertical, reinforced concrete, right circular cylinder fixed at the bottom and free at the top. The outside face of the weir wall is covered with a stainless steel clad carbon steel liner plate, which forms the inner boundary of the suppression pool. The weir wall supports the steel floor framing at El. 114'-6", pipe supports, and pipe restraints, and provides missile protection during a design basis event.

Refueling and Reactor Servicing Areas

The refueling pool, located on and integrally attached to the drywell roof, consists of reinforced concrete walls and floors. The outer walls of the drywell form the boundary of the refueling pool. Three interior cross walls forming four smaller compartments subdivide this large pool. The interior face of the pool is lined with a stainless steel liner plate. A horizontal transfer tube penetration at one end of the pool allows transfer for fuel elements between the containment and the auxiliary building.

The containment building is supplied with a refueling platform for fuel movement and servicing, an auxiliary platform for servicing operations from the refueling floor level, and a vessel platform for reactor servicing from the vessel flange level. These components perform the following functions:

- The refueling platform is a gantry crane used to transport fuel and reactor components to and from pool storage and the reactor vessel. The platform spans the fuel storage and vessel pools on bedded tracks in the refueling floor. A telescoping mast and grapple, suspended from a trolley system, lifts and orients fuel bundles for core, storage rack, and upender placement.

- The auxiliary platform operates over the upper containment pools and provides an additional work area for reactor servicing. A hoist is provided for reactor servicing tasks. Part of the auxiliary platform is used as the vessel flange level service platform.

- The reactor level servicing platform provides a reactor flange level working surface for in-vessel inspection and reactor internals servicing, and permits servicing access for the full vessel diameter. Typical operations to be performed are inservice inspection and jet pump servicing. No hoisting equipment is provided with this platform.

The containment building has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide shelter, support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The containment building houses equipment credited in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48) for SBO (10 CFR 50.63) and for anticipated transients without scram (10 CFR 50.62).
- Provide radiation-shielding barriers to offsite radiation exposure.
- Provide structural support to limit the release of radioactive materials so that offsite doses from a postulated design basis accident are below the guideline values of 10 CFR 100.

- Provide structural support to limit the release of radioactive materials so that offsite doses from a postulated refueling accident are below the guideline values of 10 CFR 50.67.
- Provide a heat sink during normal operational transients and accident conditions (suppression pool).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

Section 1.2.2.2	Figure 3.8-58
Section 3.8.1	Figure 3.8-59
Section 3.8.3.1	Figure 3.8-60
Section 3.8.4.1	Figure 3.8-61
Section 9.1.4.2	

Components Subject to Aging Management Review

Structural commodities are structural members that support or protect plant equipment including system components, piping, and electrical conductors. Structural commodities that are unique to the containment 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.

2.4.2 Water Control Structures

Description

The water control structures reviewed in this section are the standby service water (SSW) cooling towers and Culvert No.1 and its drainage channel.

Standby Service Water Cooling Towers

The Ultimate Heat Sink is comprised of two separate, seismic Category I, mechanical draft cooling tower/pumphouse/basin structures. Each tower consists of four cells, and each cell has a separate stack. Only four cells are required to support Unit 1 operation.

The SSW cooling tower basins are the source of supply to the SSW system and do not perform any other function. The two SSW cooling tower/pumphouse/basin structures are located northwest of the containment building. The structure-supporting components and general construction are described below.

(1) A makeup water storage basin consists of a reinforced concrete base slab, exterior walls, interior walls and columns to support the cooling tower, a reinforced concrete cover slab, a pumphouse, and a valve room. The SSW cooling tower basins which support the SSW cooling towers are supported on reinforced concrete base mats and founded on the Catahoula Formation.

(2) A pumphouse supported on the basin roof slab houses the SSW and HPCS pumps (Pumphouse A) or one SSW pump (Pumphouse B) and related equipment and piping. It consists of a concrete operating floor slab and exterior walls and roof to protect the seismic Category I equipment from tornado winds and missiles. To prohibit debris from entering the piping system, a platform with perforated plate is provided over the sump area from which the SSW and HPCS service water pumps take suction.

(3) A pipe and valve room consists of a reinforced concrete enclosure structure above the basin cover slab to protect the seismic Category I piping and valves from tornado winds and missiles.

(4) The mechanical draft SSW cooling towers supported by the basin columns and interior walls consist of concrete exterior walls, interior walls, columns and beams, a roof slab, and four concrete fan stacks with steel grating over each fan stack top to protect the fans from tornado-entrained debris. The stacks are designed to provide full horizontal missile protection for the fans. The towers are provided with air intake louvers in the side wall and contain fill within the frame structure.

The two structures have the following intended functions for 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

- Provide a flow path for cooling water from safety-related and nonsafety-related cooling water systems.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.
- Maintain ultimate heat sink.
- Provide support, shelter and protection for equipment credited in the Appendix R safe shutdown capability analysis and for fire protection (10 CFR 50.48).

Culvert No. 1 and Drainage Channel

Culvert No.1 is located at the downstream end of the drainage channel draining the area designated as Basin B. The drainage channel provides flow to the floodplain area by access through the culvert located under the access road. The channel and culvert are designed to safely pass the probable maximum flood from Basin B without endangering safety-related facilities.

Culvert No. 1 is a corrugated metal pipe culvert with a reinforced concrete headwall at the point of entry. The drainage channel consists of a reinforced concrete slab with soil and riprap slopes.

Culvert No.1 and the drainage channel have no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

Culvert No.1 and the drainage channel have the following intended function for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References

SSW Cooling Towers

Section 1.2.2.2	Figure 1.2-1
Section 3.8.4.1.1.4	Figure 3.8-89 through 3.8-100
	Figure 3.8-116

Culvert No. 1 and Drainage Channel

Section 2.4.3.5.3	Figure 2.4-7a

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.

2.4.3 Turbine Building, Process Facilities and Yard Structures

Description

The following structures are included in this review.

- Turbine Building
- Process Facilities
  - Auxiliary Building
  - Control Building
  - Diesel Generator Building
  - Radioactive Waste Building
- Yard Structures
  - Condensate Storage Tank Foundation
  - Condensate Storage and Refueling Water Storage Tank Retaining Basin
  - Containment Building (GGN2)
  - Control House—Switchyard
  - Diesel Generator Fuel Oil Storage Tanks Access Tunnel
  - Fire Water Pumphouse and Storage Tanks Foundation
  - Manholes and Duct Banks
  - Radioactive Waste Building Pipe Tunnels
  - Refueling Water Storage Tank Foundation
  - Transformer and Switchyard Support Structures and Foundations

Turbine Building

The turbine building is a non-Category I structure located adjacent to seismic Category I structures. The turbine building houses all equipment associated with the main turbine generator. Other auxiliary equipment, such as the main steam isolation system supports, is also located in this building. There are safety-related instruments in the turbine building, but the building, including the foundation, is designed to seismic Category I requirements and tornado effects (except the siding and its supporting members) and will have no adverse effects on the adjacent Category I structures.

The building is constructed of reinforced concrete and structural steel with metal roof decking, and interior walls are concrete and concrete block construction. The structure consists of structural steel and exterior siding above the operating floor at El. 166'-0" and of reinforced concrete below El. 166'-0".

The turbine building has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide structural support to safety-related equipment.

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.
- Provide support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal.

UFSAR References: Section 1.2.2.2, Section 3.8.4.1.2, Figures 1.2-2 through 1.2-8

Process Facilities

Auxiliary Building

The auxiliary building is a seismic Category I structure and completely encircles the containment from base mat to mid-height. The auxiliary building houses the auxiliary systems, both normal and emergency, of the nuclear steam supply system and the fuel-handling facilities. The building also houses electrical, instrumentation and piping penetration rooms, electrical equipment, and ventilation systems for the auxiliary building, containment, fuel handling area, and standby gas treatment. The auxiliary building and the enclosure building are combined to form a secondary containment to provide a controlled environment in which radiation leakage from the primary containment can be collected, filtered, and released to the atmosphere in a controlled manner. The auxiliary building steam tunnel, located on the lower elevation, provides support for the main steam lines which pass through the tunnels connecting the containment building main steam tunnel to the turbine building.

The auxiliary building is constructed of a reinforced concrete/structural steel sub- or superstructure supported on a reinforced concrete base mat on structural fill. The entire structure is founded on the Catahoula Formation. The building is a multilevel structure with floor slabs, reinforced concrete walls, structural steel columns, and composite columns supported by the concrete foundation. Reinforced concrete block walls make up portions of the internal structure. There are substitutions of reinforced masonry block walls. These occur only where walls are not utilized as shear walls, are used only for shielding/protection purposes, or are used for removable partitions for the installation of equipment.

The floor and roof systems are of composite construction, utilizing structural steel framework and reinforced concrete slabs. A horizontal waterstop is provided between the control, turbine, and containment foundations and the auxiliary building foundation. Vertical waterstops are placed in the walls at various locations to provide watertightness.

The auxiliary building contains three types of removable wall sections:

(1) Steel framing with bolted connections is used with horizontally and vertically reinforced solid concrete block walls. This system is sandwiched between steel cover plates to form the removable section.

(2) Steel framing with bolted connections is used with solid concrete block walls without horizontal and vertical reinforcement and mortar. This system is sandwiched between steel cover plates to form the removable section.

(3) Removable hatch covers within the building may be constructed of steel or concrete. Hatch covers located on the roof are constructed of reinforced concrete and are protected from tornado missiles. Concrete missile barriers are also provided to protect louvers, doors and other vulnerable areas against tornado missiles.

The building contains massive reinforced concrete spent fuel and cask storage pools. The pools have thick concrete walls and floors that are lined on the inside surfaces with stainless steel liner plates. Leak tightness is assured by means of a leak chase system connected to the leak detection system. The cask washdown area and the new fuel storage vault are also part of this massive concrete system, which is a monolithic part of the auxiliary building. The new fuel storage vault racks (located inside the auxiliary building) are designed to prevent an accidental critical array, even in the event the vault becomes flooded or subjected to seismic loadings. The new fuel storage racks are made from aluminum. High density stainless steel spent fuel racks are installed in the auxiliary building spent fuel pool and in the upper containment fuel pool. Spent fuel storage racks provide a place in the fuel pool for storing spent fuel received from the reactor vessel. Some racks are physically blocked from storing fuel assemblies by the installation of ½ guides which prevent fuel from being inserted into a given storage location.

The structure includes a bridge type 150-ton fuel cask crane and a new fuel bridge crane. The fuel cask crane is supported by the reinforced concrete column walls which span the length of the fuel handling area. The new fuel bridge crane is a 5-ton capacity general service crane in the fuel handling area. Its range includes the entire fuel handling area. The primary service of the new fuel bridge crane is the handling of the new fuel. The crane rails run below the fuel cask crane rails and above the fuel handling area platform rails. Both cranes and their supporting structures comply with seismic Category I requirements.

This structure has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) or (a)(3).

- Provide shelter, support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The auxiliary building houses equipment credited in the Appendix R safe shutdown analysis, for fire protection (10 CFR 50.48) and station blackout (SBO) (10 CFR 50.63).
- Provide radiation-shielding barriers to off-site radiation exposure.
- Provide missile protection for the portion of the reactor coolant pressure boundary located in the auxiliary building steam tunnel.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References: Section 1.2.2.2, Section 3.8.4.1.1; Figures 3.8-77 through3.8-85

Control Building

The control building is located adjacent to the turbine and auxiliary buildings and houses the main control room, upper cable spreading room, safeguard switchgear, and battery rooms. The structure contains the control room envelope or pressure boundary consisting of all rooms at the control room elevation of the control building. Included in this envelope is the control room, offices, kitchen, toilet, emergency dormitory, dining area, the safety-related panel room of the upper cable-spreading room, and several closets and storage rooms where access is required after a DBA. Airtight doors are provided at the access points and from the control room envelope. Concrete walls and floors provide shielding for this envelope.

The building is a multilevel reinforced concrete and steel structure. The structure is composed of composite sections of concrete slabs resting on steel beams. The foundation for the control building is a reinforced concrete base mat founded on the Catahoula formation. The mat is physically separated from adjoining buildings by compressible material to prevent seismic interaction. The interior walls are reinforced concrete masonry block walls. The exterior walls above grade are a minimum of two feet thick and separated from the adjacent turbine and auxiliary buildings by compressible material. The exterior openings (doors and louvers) of the control building are equipped with seals which make the openings capable of withstanding differential atmospheric pressures. Watertight door seals are installed in locations subject to flooding to provide protection of equipment. The roof is a composite section with a concrete slab which also provides for missile protection. Concrete missile barriers provide protection for louvers and other vulnerable openings against tornado generated missiles. The control room ceiling system is designed to withstand seismic loadings utilizing a structural steel space truss system.

The structure has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide functional support as a habitable environment for the operators in the control room post-accident.
- Provide radiation and missile shielding protection.
- Provide support, shelter and protection for control room building components credited in the Appendix R safe shutdown capability analysis (10 CFR 50.48) and for SBO (10 CFR 50.63).
- Maintain integrity of nonsafety-related components such that safety functions are not affected.

UFSAR References: Section 1.2.2.2, Section 3.8.4.1, Section 3.8.5.4, Figures 3.8-101 through 3.8-110

Diesel Generator Building

The diesel generator building is a seismic Category I structure that provides shelter and protection to the emergency diesel generators. The building contains the three diesel generators, three fuel oil day tanks, six starting air receivers-compressors, air intake vents and filters, mufflers, and controls. Each diesel generator and its associated equipment are housed in individual rooms within the diesel generator building. The diesel generators provide standby AC power required for engineered safety features (ESF) systems. The building interior and exterior walls that separate the diesel generators and associated equipment constitute a fire barrier wall. Exterior doors contain seals to prevent potential flooding from water in-leakage. The east wall of the building, adjacent to the auxiliary building, contains space for a piping and electrical chase. Fuel oil day tanks are provided with protective dikes to contain spillage, and each room is provided with sumps to prevent fluid build up in the area.

The building is a three-celled (one for each generator), one-story, concrete structure supported by a reinforced concrete base slab founded on structural backfill. The base mat is separated from the auxiliary building by compressible material to prevent seismic interaction. The building consists of exterior and interior walls of reinforced concrete with wall footings on consolidated structural fill. Louvers with missile protection are provided in the upper portion of the west exterior wall. Containment dikes provided for fuel oil are of concrete construction. The diesel generators rest upon individual concrete foundations, separated from the building foundation.

The structure has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The diesel generator building houses equipment (emergency diesel generators) credited in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References: Section 1.2.2.2, Section 3.8.4.1.1.6, Section 3.8.4.4.6; Figure 3.8-111

Radioactive Waste Building

The radioactive waste building, located adjacent to and south of the turbine building, houses liquid radwaste, solid radwaste, and the offgas system and the various equipment and tanks associated with the offgas system. This equipment includes various drain collection and sampling tanks, charcoal adsorbers, dryers, pumps, etc. The building is physically separated from adjacent structures. The radwaste building is a non-Category I structure designed to comply with Category I requirements to prevent uncontrolled release of radioactivity from waste material to the environment.

The radwaste building is partially embedded in soil. The building is a multilevel structure with floor slabs, reinforced concrete walls, concrete block walls and structural steel. The reinforced concrete walls and structural steel columns support the superstructure. The floor and roof systems are of composite construction, utilizing structural steel framework and reinforced concrete slabs. The foundation is a reinforced concrete mat supported on structural fill. Waterstops are provided between the turbine and radwaste building foundation and are placed between the walls of the two buildings to provide watertightness.

This structure has no intended function for 10 CFR 54.4 (a)(1) or (a)(3).

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

- Maintain structural integrity of nonsafety-related components such that safety functions are not affected and no impact on in-scope structures.

UFSAR References: Section 3.8.4.1

<u>*Yard Structures*</u>

Condensate Storage Tank Foundation

The condensate storage tank (CST) foundation supports the condensate storage tank, which provides the required condensate capacity and flow of condensate for the reactor core isolation cooling (RCIC) and high pressure core spray (HPCS) systems and maintains the required level in the condenser hotwell. One 300,000-gallon capacity condensate storage tank supplies the various station requirements. It is located adjacent to the refueling water storage tank (RWST) and shares a common concrete retaining basin with the RWST. If the plant should lose offsite power, a cross-connection from the plant fire protection water system to the condensate and refueling water storage and transfer system is provided as a backup fire water source.

The CST foundation consists of reinforced concrete founded on structural fill.

The CST foundation has the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.
- Provide support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The condensate storage tanks foundation supports equipment (condensate storage tanks) credited in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48) and for SBO (10 CFR 50.63).

UFSAR References: Section 1.2.2.8

Condensate Storage and Refueling Water Storage Tank Retaining Basin

The CST and RWST retaining basin is integral to the foundation of the CST and RWST. The retaining basin is sized to retain the full capacity of the CST and the RWST to prevent an uncontrolled release of the contents.

The retaining basin is a reinforced concrete structure supported on compacted structural fill.

The CST and RWST retaining basin has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

The CST and RWST retaining basin has the following intended function for 10 CFR 54.4(a)(2).

- Provide support and protection of the CST and RWST.

UFSAR References: Section 1.2.2.8, Section 9.2.6.2

Containment Building (GGN2)

The containment building (GGN2), located adjacent to the control building, is partially complete and abandoned in place. It contains no system or components required for plant operations. Even though construction of Unit 2 containment has been abandoned, the partially completed building still remains. This structure was evaluated in its unfinished state to determine the impact of the design ground water level change from El. 109'-0" to El. 114'-6". The structure was evaluated for overturning, buoyancy, and sliding. For buoyancy and overturning the structure was determined have a safety factor less than 1. To determine if there would be any impact on Unit 1, the maximum seismic displacement was determined. For the containment building, the auxiliary building encompasses it and the maximum seismic displacement was determined to be less than the 2 inch gap between the containment building and auxiliary building. This evaluation determined there is no impact to Unit 1 structures. The partially completed external concrete walls provide missile protection for louvers and other vulnerable openings of the control building against tornado generated missiles. The structure has no safety function and its failure will not compromise any safety-related system or component and will not prevent safe reactor shutdown.

The containment building (GGN2) is made of reinforced concrete and is open to the atmosphere above El 243'-6".

This containment building (GGN2) has no intended functions for 10 CFR 54.4(a)(1) and (a)(3).

This containment building (GGN2) has the following intended functions for 10 CFR 54.4(a)(2).

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.
- Provide missile protection for portions of the control building external openings.

UFSAR References: Table 3.5-8

Control House—Switchyard

The switchyard control house is a single-story structure in the main switchyard housing relays associated with the off-site 500 kV and 115 kV lines. It is a prefabricated metal building supported on a reinforced concrete slab foundation. The building is non-seismic and provides protection for equipment in the building required for recovery from station blackout.

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

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

- Provide support and shelter for electrical equipment required for station blackout recovery.

UFSAR References: None

Diesel Generator Fuel Oil Storage Tanks Access Tunnel

The diesel generator fuel oil storage tank access tunnel provides access to fuel oil pumps associated with the diesel generator fuel oil storage tanks. Each tank is buried in structural backfill and a separate shaft constructed from a 6-foot diameter corrugated metal pipe provides access to each pump. This access shaft is protected against missiles by a reinforced concrete slab provided with a manhole cover.

The diesel fuel oil storage tanks access tunnel has no intended function for 10 CFR 54.4(a)(1).

The diesel fuel oil storage tanks access tunnel has the following intended functions for 10 CFR 54.4(a)(2) and (a)(3).

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.
- Provide structural and functional support for safety-related equipment and nonsafety-related equipment within the scope of license renewal. The tunnel provides access to fuel oil tanks which support equipment (emergency diesel generators) credited in the Appendix R safe shutdown analysis for fire protection (10 CFR 50.48).

UFSAR References: Section 3.8.4.4, Figure 3.8-87

Fire Water Pumphouse and Storage Tanks Foundation

The fire water pumphouse and the storage tanks foundation provide support for the site fire protection water supply system. The fire water pumphouse houses three 1500-gpm fire pumps (one electric, two diesel), separated by three individual rooms, supplying water from two 300,000-gallon nominal capacity water storage tanks. The fire water pumphouse consists of structural steel with a metal siding exterior and internal walls of concrete block. The pumphouse is supported on a reinforced concrete foundation on compacted granular structural fill.

The fire water storage tanks foundation supports two 300,000-gallon nominal capacity water storage tanks. The tanks are supported by a circular reinforced concrete foundation and compacted granular fill.

These structures have no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

The fire water pumphouse and storage tanks foundation have the following intended function for 10 CFR 54.4(a)(3).

- Provide support, shelter and protection for components credited for fire protection (10 CFR 50.48).

UFSAR References: None

Manholes and Duct Banks

Manholes and duct banks exist in the GGNS yard to allow underground routing of cables and piping. The seismic Category I electrical manholes are located in the yard between the standby service water cooling tower and the control building. The duct banks are located in the yard between the standby service water cooling towers and the control building, and the diesel generator building and the diesel fuel oil storage tanks.

Manholes are reinforced concrete structures buried in structural backfill and fitted with a ductile cast iron manhole cover for access. Duct banks are located below grade in structural backfill and consist of reinforced concrete, which encloses the electrical conduits, providing missile protection.

These structures have the following intended functions for 10 CFR 54.4(a)(1), (a)(2) and (a)(3).

- Provide support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal.
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

- Provide support and protection for safety-related equipment and nonsafety-related equipment within the scope of license renewal. Manholes and duct banks house cable credited in the Appendix R safe shutdown analysis (10 CFR 50.48) and for station blackout (10 CFR 50.63). Manhole seals are credited for fire protection (10 CFR 50.48).

UFSAR References: Section 3.8.4.1.1.2, Section 3.8.4.1.1.3, Figure 3.8-88, Figure 8.2-3

Radioactive Waste Building Pipe Tunnels

The radwaste building pipe tunnels are underground structures which run from the auxiliary building to the radwaste building. This structure houses nonsafety-related piping, electrical conduits, ducts, and sumps. The tunnels are located under the auxiliary, turbine, and radwaste building base mats. Also, a portion of the tunnel runs parallel to and outside of the radwaste building. The tunnels are separated from the building foundations with a horizontal, compressible material and a continuous waterstop.

The tunnels consist of reinforced concrete walls and a base slab. The tunnel at the outside of the radwaste building takes a box shape with a monolithic top cover. The tunnels' base slabs rest on compacted structural fill supported by the Catahoula Formation and the sides are covered with either compacted backfill or mass concrete. The tunnel sumps are lined with stainless steel plates and the entire system is waterproofed.

This structure has no intended functions for 10 CFR 54.4(a)(1) or (a)(3).

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

- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

UFSAR References: Section 3.8.4.1.2.3

Refueling Water Storage Tank Foundation

The RWST foundation provides support for a 350,000-gallon capacity stainless steel refueling water storage tank. The storage tank is located adjacent to the CST north of the auxiliary building and supported on a reinforced concrete slab on grade integral with the retaining basin. The RWST and the CST are enclosed by a single concrete retaining basin. The retaining basin is sized to retain the full capacity of the RWST and the CST. The RWST is normally empty. The RWST has no safety function and failure of the tank foundation will not compromise any safety-related system or component and will not prevent safe reactor shutdown. However, failure of the foundation, being integral to the retaining basin, could compromise the intended functions associated with the retaining basin.

The RWST foundation consists of reinforced concrete founded on compacted structural fill.

The RWST foundation has no intended function for 10 CFR 54.4(a)(1) and (a)(3).

The RWST foundation has the following intended function for 10 CFR 54.4(a)(2).

- Maintain structural integrity of nonsafety-related structural components for the support and protection of the CST and RWST.

UFSAR References: Section 9.2.6.2

Transformer and Switchyard Support Structures and Foundations

The purpose of the these structures is to provide physical support to the startup and emergency station service transformers and the other transformer and switchyard components in the SBO offsite power recovery path. These support structures include the transformer foundations and foundations for the associated transformer and switchyard breakers, switchyard bus, and fused disconnect.

GGNS electrical off-site AC power systems consist of two independent systems, the 500 kV system and the 115 kV system. GGNS has three offsite AC preferred power sources via two 500 kV lines and one 115 kV line providing AC power to station loads during normal operations.

The off-site power sources required to support AC power recovery following an SBO are any one of the GGNS three preferred offsite power sources via the respective engineered safety feature (ESF) transformer (ESF 11/12/21).

The 500 kV switchyard is the source of two physically independent preferred off-site power sources via service transformers 21 and 11 in the GGNS 34.5 kV substation, via 500 kV breakers J5208 and J5204 for 21, and breakers J5236 and J5232 for 11. Service transformers 21 and 11 provide power to the 34.5 kV buses 21R and 11R via breakers 552-2105 and 552-1105. Buses 11R and 21R provide power to the ESF transformers (34.5 kV to 4.16 kV) 11 and 21 via bus 11R breaker 552-1104, and bus 21R breaker 552-2104. ESF 11 or 21 is capable of supplying power to 4.16 kV safety buses (15AA/16AB/17AC) and the balance-of-plant (BOP) buses. Components in the 34.5 kV and 4.16 kV preferred off-site power paths consists of control circuit cables and connections, underground medium-voltage cables and connections, high-voltage insulators, and switchyard bus.

The 115 kV switchyard is the source of the third physically independent preferred off-site power source via ESF transformer 12 (115 kV to 4.16 kV). The 115 kV system supplies power to ESF12 transformer via disconnect J3881 at the 115 kV switchyard. ESF12 is capable of supplying power to 4.16 kV safety buses (15AA/16AB/17AC). Components in the 115 kV preferred off-site power recovery path consists of control circuit cables and connections, high voltage insulators, overhead transmission conductors, underground 115 kV conductors and connections in a duct bank, switchyard bus and connections, and medium-voltage cables and connections.

The NRC guidance for SBO recovery recommends including systems and structures relied upon to restore offsite AC power within the scope of license renewal. The GGNS current licensing basis (CLB) does not include the offsite power path for SBO (10 CFR 50.63), but these items are being conservatively included in the scope of license renewal as part of 10 CFR 54.4(a)(3).

The offsite power transformers and switchyard support structures and foundations have no intended functions for 10 CFR 54.4(a)(1) or (a)(2).

These structures have the following intended function for 10 CFR 54.4(a)(3).

- Provide support for equipment credited for station blackout (10 CFR 50.63).

UFSAR References: Section 8.2 and Section 8.3 discuss the system function.

UFSAR References

Turbine Building

Section 1.2.2.2	Figures 1.2-2 through 1.2-8
Section 3.8.4.1.2	

Auxiliary Building

Section 1.2.2.2	Figures 3.8-77 through 3.8-85
Section 3.8.4.1.1	

Control Building

Section 1.2.2.2	Figures 3.8-101 through 3.8-110
Section 3.8.4.1	
Section 3.8.5.4	

Diesel Generator Building

Section 1.2.2.2	
Section 3.8.4.1.1.6	Figure 3.8-111
Section 3.8.4.4.6	

Radioactive Waste Building

Section 3.8.4.1

Condensate Storage Tank (CST) Foundation

Section 1.2.2.8

Condensate Storage and Refueling Water Storage Tank Retaining Basin

Section 1.2.2.8
Section 9.2.6.2

Containment Building (GGN2)

Table 3.5-8

Control House—Switchyard

None

Diesel Generator Fuel Oil Storage Tanks Access Tunnel

Section 3.8.4.4 Figure 3.8-87

Fire Water Pumphouse and Storage Tanks Foundation

None

Manholes and Duct Banks

Section 3.8.4.1.1.2 Figure 3.8-88
Section 3.8.4.1.1.3 Figure 8.2-3

Radioactive Waste Building Pipe Tunnel

Section 3.8.4.1.2.3

Refueling Water Storage Tank Foundation

Section 9.2.6.2

Transformer and Switchyard Support Structures and Foundations

Section 8.2 and Section 8.3 discuss the system function.

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.

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 (anchors, embedments, pipe and equipment supports, instrument panels and racks, cable trays, conduits, etc.) are addressed in this section as well as seismic II/I supports.

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.
- Provide support and protection for equipment credited in the Appendix R safe shutdown analysis and for fire protection (10 CFR 50.48), for anticipated transients without scram (10 CFR 50.62), and for station blackout (10 CFR 50.63).
- Maintain integrity of nonsafety-related structural components such that safety functions are not affected.

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 2.4-1
Containment Building
Components Subject to Aging Management Review

Component	Intended Function[a]
Steel and Other Metals	
Auxiliary platform equipment assembly and rails	Support for Criterion (a)(2) equipment
Containment cylinder wall liner plate	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Containment cylinder wall mechanical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Containment cylinder wall electrical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Containment equipment hatch	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Containment hatchway crane—crane rails	Support for Criterion (a)(2) equipment
Containment hatchway crane structural girders	Support for Criterion (a)(2) equipment
Containment personnel lock	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Containment sumps liner and penetrations	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell electrical penetrations	Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment

Table 2.4-1 (Continued)
Containment Building
Components Subject to Aging Management Review

Component	Intended Function[a]
Drywell equipment hatch	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell head	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell head access manway	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell liner plate	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Drywell mechanical penetrations	Pressure boundary Support for Criterion (a)(1) equipment
Drywell personnel access lock	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Fuel transfer tube penetration	Pressure boundary Support for Criterion (a)(1) equipment
Guard piping	Missile barrier Pressure boundary Shelter or protection
Metal siding	Pressure boundary Shelter or protection
Monorails	Support for Criterion (a)(2) equipment
Penetration bellows	Pressure boundary Support for Criterion (a)(1) equipment

**Table 2.4-1 (Continued)
Containment Building
Components Subject to Aging Management Review**

Component	Intended Function[a]
Personnel airlock, equipment hatch and drywell head bolting	Pressure boundary Support for Criterion (a)(1) equipment
Polar crane—rails	Support for Criterion (a)(2) equipment
Polar crane—structural girders	Support for Criterion (a)(2) equipment
Quencher support	Support for Criterion (a)(1) equipment
Reactor shield wall (steel portion)	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Reactor vessel support (ring girder)	Support for Criterion (a)(1) equipment
Refueling platform equipment assembly—rails	Support for Criterion (a)(2) equipment
Refueling platform equipment assembly—structural steel	Support for Criterion (a)(2) equipment
Refueling pool gate	Shelter or protection Support for Criterion (a)(1) equipment
Refueling pool liner plate	Shelter or protection Support for Criterion (a)(1) equipment
Roof decking	Pressure boundary Shelter or protection
RPV cavity liner	Shelter or protection Support for Criterion (a)(1) equipment
RPV pedestal sump liner and penetrations	Shelter or protection Support for Criterion (a)(1) equipment
Structural steel: beams, columns and plates	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

**Table 2.4-1 (Continued)
Containment Building
Components Subject to Aging Management Review**

Component	Intended Function[a]
Suppression pool liner plate	Heat sink Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Upper containment pool liner plate and gate	Shelter or protection Support for Criterion (a)(1) equipment
Upper containment pool spent fuel storage racks	Support for Criterion (a)(1) equipment
Weir wall liner plate	Heat sink Support for Criterion (a)(1) equipment
Concrete	
Beams, columns, floor slabs and interior walls	Flood barrier Missile barrier Shelter or protection Support for Criterion (a)(3) equipment Support for Criterion (a)(1) equipment
Containment base slab/foundation	Flood barrier Pressure boundary Support for Criterion (a)(3) equipment Support for Criterion (a)(1) equipment
Containment foundation	Flood barrier Pressure boundary Support for Criterion (a)(3) equipment Support for Criterion (a)(1) equipment
Containment cylinder wall and dome	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
Containment sump structures	Support for Criterion (a)(1) equipment

Table 2.4-1 (Continued)
Containment Building
Components Subject to Aging Management Review

Component	Intended Function[a]
Drywell floor slab	Shelter or protection Support for Criterion (a)(1) equipment
Drywell wall	Missile barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment
Main steam pipe tunnel	Missile barrier Pressure boundary Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Masonry walls	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Reactor pedestal	Support for Criterion (a)(1) equipment
Upper containment pool floor and walls	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Containment building electrical penetration seals and sealant	Pressure boundary Support for Criterion (a)(1) equipment
Moisture barrier	Shelter or protection Support for Criterion (a)(1) equipment
Rubber seal for airlock doors, equipment hatch	Pressure boundary Support for Criterion (a)(1) equipment
Service Level I coatings	Support for Criterion (a)(2) equipment
Upper containment pool gates rubber gasket/seal	Shelter or protection

a. Intended functions are defined in Table 2.0-1.

Table 2.4-2
Water Control Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Steel and Other Metals	
Basin debris screen and grating	Shelter or protection Support for Criterion (a)(1) equipment
Cooling tower fill	Heat sink Support for Criterion (a)(2) equipment
Culvert No. 1	Support for Criterion (a)(2) equipment
Fan stack grating	Heat sink Missile barrier Shelter or protection Support for Criterion (a)(2) equipment
Monorail	Support for Criterion (a)(2) equipment
Structural steel, beams, columns, and plates	Heat sink Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Concrete	
Beams, and columns	Heat sink Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Culvert No. 1	Support for Criterion (a)(2) equipment
Exterior walls above grade	Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Exterior walls below grade	Heat sink Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-2 (Continued)
Water Control Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Floor slab	Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Foundation	Heat sink Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Interior walls	Heat sink Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Masonry walls	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Roof hatches	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Roof slabs	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Other Materials	
Cooling tower drift eliminators	Heat sink Support for Criterion (a)(2) equipment
Cooling tower fill	Heat sink Support for Criterion (a)(2) equipment
Drainage channel	Support for Criterion (a)(2) equipment

a. Intended functions are defined in Table 2.0-1.

Table 2.4-3
Turbine Building, Process Facilities and Yard Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Steel and Other Metals	
Control room ceiling support system	Support for Criterion (a)(2) equipment
Cranes: rail	Support for Criterion (a)(2) equipment
Cranes: structural girders	Support for Criterion (a)(2) equipment
Metal siding	Support for Criterion (a)(3) equipment
Monorails	Support for Criterion (a)(2) equipment
New fuel storage racks	Shelter or protection Support for Criterion (a)(1) equipment
Pressure relief panels	Support for Criterion (a)(2) equipment
Roof decking	Fire barrier Support for Criterion (a)(3) equipment
Spent fuel pool liner plate and gate	Shelter or protection Support for Criterion (a)(1) equipment
Spent fuel storage racks	Shelter or protection Support for Criterion (a)(1) equipment
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
Sump liners	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Transmission towers	Support for Criterion (a)(3) equipment

Table 2.4-3 (Continued)
Turbine Building, Process Facilities and Yard Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Concrete	
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
CST/RWST retaining basin (wall)	Shelter or protection Support for Criterion (a)(2) equipment
Diesel fuel tank access tunnel slab	Missile barrier Shelter or protection Support for Criterion (a)(1) equipment
Duct banks	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Exterior 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
Exterior walls (below grade)	Missile barrier Flood barrier Pressure boundary Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Foundations (buildings, transformers, tanks, circuit breakers)	Shelter or protection Support for Criterion (a)(3) equipment Support for Criterion (a)(1) equipment

Table 2.4-3 (Continued)
Turbine Building, Process Facilities and Yard Structures
Components Subject to Aging Management Review

Component	Intended Function[a]
Manholes	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
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
Roof slabs	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
Sumps	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Other Materials	
Wooden utility poles	Support for Criterion (a)(3) equipment
Wooden utility towers	Support for Criterion (a)(3) equipment

a. Intended functions are defined in Table 2.0-1.

Table 2.4-4
Bulk Commodities
Components Subject to Aging Management Review

Structure and/or Component/ Commodity	**Intended Function[a]**
Steel and Other Metals	
Anchorage / embedments	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Base plates	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Battery racks	Support for Criterion (a)(1) 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
Cable trays support	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Component and piping supports for ASME Class 1, 2, 3 and MC	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Component and piping supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduits	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Conduit supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Damper framing	Fire barrier
Electrical and instrument panels and enclosures	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Structure and/or Component/ Commodity	Intended Function[a]
Fire doors	Fire barrier
Fire hose reels	Support for Criterion (a)(3) equipment
Flood, pressure and specialty doors	Flood barrier Missile barrier Pressure boundary Shelter or protection
HVAC duct supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Instrument line supports	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Instrument racks, frames and tubing trays	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) 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
Penetration sleeves (mechanical/ electrical not penetrating primary containment boundary)	Flood barrier Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Pipe whip restraints	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Structure and/or Component/ Commodity	Intended Function[a]
Stairway, handrail, platform, grating, decking, and ladders	Support for Criterion (a)(2) equipment
Support members: welds; bolted connections; support anchorages to building structure	Shelter or protection Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment
Vents and louvers	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
ASME Class 1, 2, 3 and MC Supports bolting	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Structural bolting	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Concrete	
Equipment pads/foundations	Support for Criterion (a)(1) equipment Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment
Fire proofing	Fire barrier
Flood curbs	Fire barrier 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

Structure and/or Component/ Commodity	Intended Function[a]
Manways, hatches, manhole covers, and hatch covers	Fire barrier Flood barrier Pressure boundary Support for Criterion (a)(2) equipment Support for Criterion (a)(3) equipment Support for Criterion (a)(1) 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	
Fire stops	Fire barrier
Fire wrap	Fire barrier
Flood retention materials (spare parts)	Flood barrier
Insulation	Insulation Support for Criterion (a)(2) equipment
Penetration sealant (fire)	Fire barrier Pressure boundary Shelter or protection Support for Criterion (a)(2) equipment
Penetration sealant (flood, radiation)	Flood barrier Pressure boundary Shelter or protection Support for Criterion (a)(2) equipment
Roof membrane	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

Table 2.4-4 (Continued)
Bulk Commodities
Components Subject to Aging Management Review

Structure and/or Component/ Commodity	Intended Function[a]
Seismic isolation joint	Fire barrier Support for Criterion (a)(1) equipment
Service Level I coatings	Support for Criterion (a)(2) Equipment
Water stops	Flood barrier

a. Intended functions are defined in Table 2.0-1.

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 (EIC) systems are included in the scope of license renewal as are EIC components in mechanical systems. The default inclusion of plant EIC systems in the scope of license renewal is the bounding approach used for the scoping of electrical systems.

The basic philosophy used in the EIC 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 EIC IPA began by grouping the total population of components into commodity groups. The commodity groups include similar EIC 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 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 GGNS 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 non-highlighted portions in the off-site power circuits have no intended function for license renewal and thus are not subject to aging management review.

UFSAR References

Additional details for electrical systems and commodities can be found in UFSAR Chapters 7 and 8.

Scoping Boundaries

Plant EIC systems are included in the scope of license renewal as are EIC components in mechanical systems.

The off-site power sources required to support SBO recovery are any one of the three GGNS preferred sources via engineered safety feature (ESF) transformers (ESF 11, 12, 21), which are depicted on LRA drawing LRA-E-001.

The GGNS 34.5 kV switchyard is the source of two physically independent preferred off-site power sources (ESF 11 & 21) provided via the 500 kV switchyard. The 34.5 kV switchyard supplies power to ESF 11 & 21 transformers (34.5kV / 4.16kV) via breakers 552-1104 and 552-2104. ESF 11 & 21 are each capable of supplying power to the three 4.16 kV safety buses (15AA, 16AB, 17AC). Components in the 34.5 kV preferred off-site power paths consist of switchyard bus and connections, high-voltage insulators, control circuit cables and connections, medium-voltage cables and connections, and inaccessible medium-voltage cables and connections with manholes.

GGNS 115 kV off-site power system is the source of the third physically independent preferred off-site power source. The 115 kV system supplies power to ESF 12 transformer (115kV / 4.16kV) via breaker J1365 at the Port Gibson substation. The 115 kV line from Port Gibson to the GGNS switchyard is approximately 5.5 miles long. ESF 12 is capable of supplying power to the three 4.16 kV safety buses (15AA, 16AB, 17AC). Components in the 115 kV preferred off-site power recovery path consists of control circuit cables and connections, high voltage insulators, overhead transmission conductors and connections, underground 115 kV transmission conductors and connections with manholes, switchyard bus and connections, and medium-voltage cables and connections.

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. Wooden and steel transmission towers and foundations utilized in the 115 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, GGNS 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 EIC penetration assemblies, fuse holders outside of cabinets of active electrical components.

The commodity group cables, connections, bus, and electrical portions of EIC penetration assemblies 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.[1]
- Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits.
- EIC penetration cables and connections not subject to 10 CFR 50.49 EQ requirements.[2]
- 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 (115 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.[3]
- Metal enclosed bus - enclosures assemblies (elastomers, external surfaces).[3]
- Metal enclosed bus - insulation / insulators.[3]
- Switchyard bus and connections.
- Transmission conductors and connections.
- Uninsulated ground conductors.[4]

Commodity Groups Not Subject to AMR

Metal Enclosed Bus

GGNS does not utilize metal enclosed bus for a license renewal intended function. The majority of GGNS metal enclosed bus is part of active components (such as switchgear, power supplies, power inverters, or battery chargers) or functions as piece parts of the larger complex assembly and is therefore not subject to aging management review.

The only passive metal enclosed bus at GGNS is the iso-phase bus associated with the auxiliary transformer and main transformers. GGNS has three diverse offsite power sources without

1. GGNS electrical cables and connections subject to 10 CFR 50.49 EQ requirements are not subject to aging management review (STAMR) since the components are subject to replacement based on qualified life.
2. Includes only GGNS EIC penetrations not subject to 10 CFR 50.49 EQ requirements. GGNS EIC penetrations subject to 10 CFR 50.49 EQ requirements are not STAMR.
3. GGNS metal enclosed bus is not STAMR, because the GGNS metal enclosed bus does not perform a license renewal intended function.
4. GGNS uninsulated ground conductors limit equipment damage in the event of a circuit failure, but do not perform a license renewal intended function.

utilizing the auxiliary and main transformers. Therefore, GGNS does not credit backfeed through the main transformer as an offsite power path.

The review of GGNS metal enclosed bus indicated that they are either part of an active component or located in circuits that perform no license renewal intended function. Therefore, metal enclosed bus at GGNS is not subject to aging management review.

Uninsulated Ground Conductors

A review of the GGNS 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. 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 SOC (60FR22467), hypothetical failures that are not part of the CLB and have not been previously experienced are not required to be considered for license renewal scoping.

Table 2.5-1 lists the component types that require aging management review.

Table 3.6.2-1 provides the results of the aging management review.

Table 2.5-1
Electrical and Instrumentation and Control Systems
Components Subject to Aging Management Review

Structure and/or Component/Commodity	Intended Function[1]
Cable connections (metallic parts)	Conducts electricity
Electrical cables and connections not subject to 10 CFR 50.49 EQ requirements	Conducts electricity
Electrical cables not subject to 10 CFR 50.49 EQ requirements used in instrumentation circuits	Conducts electricity
EIC penetration cables and connections not subject to 10 CFR 50.49 EQ requirements	Conducts electricity
Fuse holders (insulation material)	Conducts electricity
Fuse holders (metallic clamp)	Conducts electricity
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	Conducts electricity
Inaccessible power (115 kV) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements (for SBO recovery)	Conducts electricity
High voltage insulators (high voltage insulators for SBO recovery)	Insulation (electrical)
Switchyard bus (switchyard bus for SBO recovery) • Bus and connections	Conducts electricity
Transmission conductors and connections (transmission conductors for SBO recovery) • Conductors and connections	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), and

  1 indicates that this is the first table type in Section 3.x.

For example, in the reactor coolant system subsection, this is Table 3.1.1, and in the engineered safety features subsection, 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, and

  y indicates the system table number.

For example, within the reactor coolant system subsection, the AMR results for the reactor vessel are presented in Table 3.1.2-1, and the results for the reactor vessel internals are in Table 3.1.2-2. In the engineered safety features subsection, the residual heat removal system results are presented in Table 3.2.2-1, and the low pressure core 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 GGNS 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, with the following exceptions.

- The ID 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 PWRs 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 (AEM)
- Aging Management Programs (AMPs)
- Further Evaluation Recommended

Further information is provided in the "Discussion" column. The Discussion column explains, in summary, how the GGNS 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 residual heat removal, low pressure core spray, high pressure core spray, reactor core isolation cooling, pressure relief, standby gas treatment, and containment penetrations.

Table 2s also provide a comparison of the AMR results with the AMR results in NUREG-1801. Comparison to NUREG-1801 is performed by considering the component type, material, environment, aging effect requiring management, and aging management program (AMP) listed in each Table 2 line item to determine the degree of consistency with an appropriate NUREG-1801 line item, if one exists. The comparison is documented in columns 7, 8, and 9, as discussed below.

Each Table 2 consists of the following nine columns.

Component Type

Column 1 identifies the component types from Section 2 of this application that are subject to aging management review.

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

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 low pressure core spray system will generally be compared to NUREG-1801 ESF system results in Chapter V, and preferably to items in Table V.D2 for the emergency core cooling systems for BWRs. 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 core 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.

Many 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
Class 1 Mechanical Environments	
Air – indoor	Air in an environment protected from precipitation.
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.
Treated water	Treated water is demineralized water and is the base water for all clean systems.[1]
Treated water > 140°F	Treated water above 140°F stress corrosion cracking (SCC) threshold for stainless steel. In determining aging effects, steam is considered treated water.
Treated water > 482°F	Treated or demineralized water above thermal embrittlement threshold for cast austenitic stainless steel (CASS).
Non-Class 1 Mechanical Environments	
Air – indoor	Air in an environment protected from precipitation.
Air – outdoor	The outdoor environment consists of atmospheric air, ambient temperature and humidity, and exposure to precipitation.
Concrete	Components in contact with 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.
Exhaust gas	Gases, fluids, particulates present in diesel engine exhaust.
Fuel oil	Diesel oil, No. 2 oil, or other liquid hydrocarbons used to fuel diesel engines, boilers, etc.
Gas	Internal dry non-corrosive gas environments such as nitrogen, carbon dioxide, Freon, and Halon.
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.

Table 3.0-1 (Continued)
Service Environments for Mechanical Aging Management Reviews

Environment	Description
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.
Sodium pentaborate solution	Treated water mixed with sodium pentaborate. (SLC system)
Soil	External environment for components buried in the soil; exposure to ground water is assumed in soil environments
Steam	Steam, subject to a water chemistry program. In determining aging effects, steam is considered treated water.
Treated water	Treated water is demineralized water and is the base water for all clean systems.[1]
Treated water > 140°F	Treated water above the SCC threshold for stainless steel
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.

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 – BWR Program.

Table 3.0-2
Service Environments for Structural Aging Management Reviews

Environment	Description
Air – indoor uncontrolled	Air with temperature less than 150°F, humidity up to 100% and protected from precipitation
Air – outdoor	Exposed to the weather with air temperature less than 115°F, humidity up to 100%
Exposed to fluid environment	Fluid environment for structures at GGNS is defined as raw water or treated water. • Raw water – Water from the plant service water radial wells provides the source of raw water utilized at GGNS. 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. GGNS 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.
Soil	External environment for components buried in the soil, including groundwater in the soil. This environment is “non-aggressive” as defined in NUREG-1801.

Table 3.0-3
Service Environments for Electrical Aging Management Reviews

Environment	Description
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 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 – 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.
Heat and air	Air – indoor controlled or uncontrolled at normal plant operating temperatures.
Moisture and air	Air – indoor controlled or uncontrolled at normal plant operating humidity.
Radiation and air	Air – indoor controlled or uncontrolled at normal plant operating radiation levels.
Significant moisture	Exposure to significant moisture (moisture that lasts more than a few days; e.g., cable in standing water).

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 2.3.1.1.1)
- Reactor Vessel Internals (Section 2.3.1.1.2)
- Reactor Coolant Pressure Boundary (Section 2.3.1.2)
- Miscellaneous RCS systems in scope for 10 CFR 54.4(a)(2) (Section 2.3.1.7)

Table 3.1.1, Summary of Aging Management Programs for the Reactor Coolant System 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

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

- Table 3.1.2-4-1 Nuclear Boiler System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.1.2-4-2 Reactor Recirculation System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.1.2.1 Materials, Environment, 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 coolant system components. Programs are described in Appendix B. Further details are provided in Tables 3.1.2-1 through 3.1.2-4-2.

3.1.2.1.1 Reactor Vessel

Materials

Reactor vessel components are constructed of the following materials.

- carbon steel
- carbon steel clad with stainless steel
- high-strength low-alloy steel
- low-alloy steel
- low-alloy steel clad with stainless steel
- nickel alloy
- stainless steel

Environment

Reactor vessel components are exposed to the following environments.

- air – indoor
- neutron fluence
- treated water
- treated 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 preload
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the reactor vessel components.

- Bolting Integrity
- BWR CRD Return Line Nozzle

- BWR Feedwater Nozzle
- BWR Penetrations
- BWR Stress Corrosion Cracking
- BWR Vessel ID Attachment Welds
- BWR Vessel Internals
- Inservice Inspection
- One-Time Inspection
- Reactor Head Closure Studs
- Reactor Vessel Surveillance
- Water Chemistry Control – BWR

3.1.2.1.2 Reactor Vessel Internals

Materials

Reactor vessel internals components are constructed of the following materials.

- CASS
- nickel alloy
- stainless steel

Environment

Reactor vessel internals components are exposed to the following environments.

- air – indoor
- neutron fluence
- treated water
- treated water > 140°F
- treated water > 482°F

Aging Effects Requiring Management

The following aging effects associated with the reactor vessel internals require management.

- cracking
- cracking – fatigue
- loss of material
- loss of material – wear
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the reactor vessel internals components.

- BWR Vessel Internals
- Inservice Inspection
- One-Time Inspection
- Water Chemistry Control – BWR

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
- nickel alloy
- stainless steel

Environment

Reactor coolant pressure boundary components are exposed to the following environments.

- air – indoor
- treated water
- treated water > 140°F
- treated water > 482°F

Aging Effects Requiring Management

The following aging effects associated with the reactor coolant pressure boundary require management.

- cracking
- cracking – fatigue
- loss of material
- loss of preload
- reduction of fracture toughness

Aging Management Programs

The following aging management programs manage the aging effects for the reactor coolant pressure boundary components.

- Bolting Integrity
- BWR Stress Corrosion Cracking
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Inservice Inspection
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- One-Time Inspection – Small-Bore Piping
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems

3.1.2.1.4 Miscellaneous RCS 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 3.1.2-4-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- carbon steel
- copper alloy >15% zinc (Zn) or > 8% aluminum (Al)
- glass
- stainless steel

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air – indoor
- lube oil
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the reactor coolant pressure boundary require management.

- cracking

- cracking – fatigue
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the reactor coolant pressure boundary components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Selective Leaching
- Water Chemistry Control – BWR

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 GGNS 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. TLAAs are evaluated in accordance with 10 CFR 54.21(c). The evaluation of fatigue for the reactor vessel is discussed in Sections 4.3.1.1 and 4.3.1.2.

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 4.3.1.3. Cracking, including cracking due to fatigue, will be managed by the BWR Vessel Internals Program for other internals components.

The evaluation of fatigue TLAA for the ASME Class 1 portions of the reactor coolant pressure boundary piping and components, including those for interconnecting systems, is discussed in Sections 4.3.1.4, 4.3.1.5, and 4.3.1.6.

3.1.2.2.2 Loss of Material Due to General, Pitting, and Crevice Corrosion

1. This paragraph in NUREG-1800 pertains to pressurized water reactor (PWR) steam generators and is therefore not applicable to GGNS.

2. This paragraph in NUREG-1800 pertains to PWR steam generator shell assemblies and is therefore not applicable to GGNS.

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. GGNS is a participant in the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP). This program monitors changes in the fracture toughness properties of ferritic materials in the reactor pressure vessel (RPV) beltline region. As described in Appendix B, the Reactor Vessel Surveillance Program is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance, including recommendations 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 reactor internals and is therefore not applicable to GGNS.

3.1.2.2.4 Cracking due to Stress Corrosion Cracking (SCC) and Intergranular Stress Corrosion Cracking (IGSCC)

1. The Water Chemistry Control – BWR and Inservice Inspection Programs manage cracking due to SCC and IGSCC in the nickel alloy vessel flange leak detection nozzle. The leak detection line downstream of the nozzle is ASME Class 2. The portion of this line that is wetted during refueling is carbon steel.

2. This paragraph in NUREG-1800 pertains to BWR isolation condenser components. GGNS does not have an isolation condenser, so this paragraph was not used.

3.1.2.2.5 Crack Growth due to Cyclic Loading

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.6 Cracking due to Stress Corrosion Cracking

Both paragraphs in NUREG-1800 apply to PWRs only.

3.1.2.2.7 Cracking due to Cyclic Loading

This paragraph in NUREG-1800 pertains to BWR isolation condenser components. As GGNS does not have an isolation condenser, this paragraph was not used.

3.1.2.2.8 Loss of Material due to Erosion

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.9 Cracking due to Stress Corrosion Cracking and Irradiation-Assisted Stress Corrosion Cracking (IASCC)

This paragraph in NUREG-1800 applies to PWRs 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

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.11 Cracking due to Primary Water Stress Corrosion Cracking (PWSCC)

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.12 Cracking due to Fatigue

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.13 Cracking due to Stress Corrosion Cracking and Fatigue

Both paragraphs in NUREG-1800 apply to PWRs only.

3.1.2.2.14 Loss of Material due to Wear

This paragraph in NUREG-1800 applies to PWRs only.

3.1.2.2.15 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of GGNS quality assurance procedures and administrative controls for aging management programs.

3.1.2.3 Time-Limited Aging Analyses

TLAA identified for the reactor coolant system include reactor vessel neutron embrittlement and metal fatigue. These topics are addressed in Section 4.

3.1.3 Conclusion

The reactor vessel, internals, and reactor coolant system components that are subject to aging management review have been identified in accordance with the requirements of 10 CFR 54.21. The aging management programs selected to manage the 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 coolant system components will be managed such that there is reasonable assurance that the intended functions will be maintained consistent with the current licensing basis during the period of extended operation.

Table 3.1.1
Summary of Aging Management Programs for the Reactor Coolant System Evaluated in Chapter IV of NUREG-1801

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-1	High strength, low-alloy steel top head closure stud assembly exposed to air with potential for reactor coolant leakage	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA, evaluated for the period of extended operation (See [Standard Review Plan] SRP, Sec 4.3 “Metal Fatigue,” for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-2	PWR only				
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, 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
3.1.1-4	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	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-5	PWR only				
3.1.1-6	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy reactor coolant pressure boundary components: piping, piping components, and piping elements exposed to reactor coolant	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
3.1.1-7	Steel (with or without nickel-alloy or stainless steel cladding), or stainless steel; or nickel alloy reactor vessel components: flanges; nozzles; penetrations; 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 (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.
3.1.1-8	PWR only				
3.1.1-9	PWR only				
3.1.1-10	PWR only				
3.1.1-11	Steel or stainless steel pump and valve closure bolting exposed to high temperatures and thermal cycles	Cumulative fatigue damage due to fatigue	Fatigue is a TLAA, evaluated for the period of extended operation (See SRP, Sec 4.3 “Metal Fatigue,” for acceptable methods to comply with 10 CFR 54.21(c)(1))	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.1.
3.1.1-12	PWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-13	Steel (with or without stainless steel cladding) reactor vessel beltline shell, nozzles, and welds exposed to reactor coolant and neutron flux	Loss of fracture toughness due to neutron irradiation embrittlement	TLAA is to be evaluated in accordance with Appendix G of 10 CFR Part 50 and RG 1.99. The applicant may choose to demonstrate that the materials of the nozzles are not controlling for the TLAA evaluations	Yes, TLAA	Fatigue is a TLAA. See Section 3.1.2.2.3 item 1.
3.1.1-14	Steel (with or without cladding) reactor vessel beltline shell, nozzles, and welds; safety injection nozzles	Loss of fracture toughness due to neutron irradiation embrittlement	Chapter XI.M31, “Reactor Vessel Surveillance”	Yes, plant specific or integrated surveillance program	Consistent with NUREG-1801. The Reactor Vessel Surveillance Program will manage loss of fracture toughness of the reactor vessel beltline materials. See Section 3.1.2.2.3 item 2.
3.1.1-15	PWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-16	Stainless steel and nickel alloy top head enclosure vessel flange leak detection line	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	A plant-specific aging management program is to be evaluated because existing programs may not be capable of mitigating or detecting crack initiation and growth due to SCC in the vessel flange leak detection line.	Yes, plant-specific	The Water Chemistry Control – BWR and Inservice Inspection Programs manage cracking in the nickel alloy head seal leak detection nozzle. The ASME Class 2 leak detection line is carbon steel. See Section 3.1.2.2.4 item 1.
3.1.1-17	Stainless steel isolation condenser components exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular 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" for BWR water, and a plant-specific verification program	Yes, detection of aging effects is to be evaluated	This item was not used. GGNS does not have an isolation condenser. See Section 3.1.2.2.4 item 2.
3.1.1-18	PWR only				
3.1.1-19	PWR only				
3.1.1-20	PWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-21	Steel and stainless steel isolation condenser components exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M1, "ASME Section XI Inservice Inspection [ISI], Subsections IWB, IWC, and IWD" for Class 1 components. The ISI program is to be augmented by a plant-specific verification program	Yes, detection of aging effects is to be evaluated	This item was not used. GGNS does not have an isolation condenser. See Section 3.1.2.2.7
3.1.1-22	PWR only				
3.1.1-23	PWR only				
3.1.1-24	PWR only				
3.1.1-25	PWR only				
3.1.1-26	PWR only				
3.1.1-27	PWR only				
3.1.1-28	PWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-29	Nickel alloy core shroud and core plate access hole cover (welded covers) exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and Chapter XI.M2, “Water Chemistry,” and for BWRs with a crevice in the access hole covers, augmented inspection using [ultrasonic testing] UT or other acceptable techniques	No	This item was not used. The shroud support access hole cover is stainless steel and does not contain creviced welds.
3.1.1-30	Stainless steel or nickel alloy penetration: drain line exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	Chapter XI.M1, “ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD,” and Chapter XI.M2, “Water Chemistry”	No	This item was not used. The GGNS vessel does not have a stainless steel or nickel alloy drain penetration.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-31	Steel and stainless steel isolation condenser components exposed to reactor coolant	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD," and Chapter XI.M2, "Water Chemistry"	No	This item was not used. GGNS does not have an isolation condenser.
3.1.1-32	PWR only				
3.1.1-33	PWR only				
3.1.1-34	PWR only				
3.1.1-35	PWR only				
3.1.1-36	PWR only				
3.1.1-37	PWR only				
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	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 – BWR 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	PWR only				
3.1.1-40.5	PWR only				
3.1.1-41	Nickel alloy core shroud and core plate access hole cover (mechanical covers) exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted 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	This item was not used. The shroud support access hole cover is stainless steel.
3.1.1-42	PWR only				

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-43	Stainless steel and nickel-alloy reactor vessel internals exposed to reactor coolant	Loss of material due to pitting and crevice corrosion	Chapter XI.M1, "ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD" for Class 1 components, and Chapter XI.M2, "Water Chemistry"	No	Loss of material for stainless steel and nickel alloy reactor vessel internals components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry program. With minor exceptions, the reactor vessel internals are not ASME Class 1 pressure boundary components and the scope of internals components inspected under the Inservice Inspection Program is limited.
3.1.1-44	PWR only				
3.1.1-45	PWR only				
3.1.1-46	PWR only				
3.1.1-47	PWR only				
3.1.1-48	PWR only				
3.1.1-49	PWR only				

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 jet pump assembly castings; orificed fuel support	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Thermal Aging and Neutron Irradiation Embrittlement of CASS	No	This item was not used. 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 (see Table Item 3.1.1-38). There no other Class 1 CASS components in the reactor coolant system pressure boundary. The main steam line flow elements (flow restrictors) are not Class 1 components. The CASS subcomponents of the flow elements are not susceptible to thermal aging embrittlement since they are composed of low-molybdenum CASS (CF8) and were centrifugally cast.
3.1.1-51	PWR only				
3.1.1-52	PWR only				
3.1.1-53	PWR only				
3.1.1-54	PWR only				
3.1.1-55	PWR only				
3.1.1-56	PWR only				
3.1.1-57	[blank line]				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-58	PWR only				
3.1.1-59	PWR only				
3.1.1-60	Steel piping, piping components, and piping elements exposed to reactor coolant	Wall thinning due to flow-accelerated corrosion	Chapter XI.M17, "Flow-Accelerated Corrosion"	No	Consistent with NUREG-1801. The Flow-Accelerated Corrosion Program will manage wall thinning due to flow-accelerated corrosion in steel piping components exposed to reactor coolant.
3.1.1-61	PWR only				
3.1.1-62	PWR only				
3.1.1-63	Steel or stainless steel closure bolting exposed to air with reactor coolant leakage	Loss of material due to general (steel only), pitting, and crevice corrosion or wear	Chapter XI.M18, "Bolting Integrity"	No	The Bolting Integrity Program, which applies to all pressure boundary bolting in the reactor coolant system with the exception of the reactor closure head studs, manages loss of material for steel bolting. Industry operating experience indicates that loss of material due to wear is not a significant aging effect for this bolting. Occasional thread failures due to wear related mechanisms, such as galling, are event-driven conditions that are resolved as required.
3.1.1-64	PWR only				

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-65	PWR only				
3.1.1-66	PWR only				
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	The Bolting Integrity Program manages loss of preload for all pressure boundary bolting in the reactor coolant system with the exception of the reactor closure head studs.
3.1.1-68	PWR only				
3.1.1-69	PWR only				
3.1.1-70	PWR only				
3.1.1-71	PWR only				
3.1.1-72	PWR only				
3.1.1-73	PWR only				
3.1.1-74	PWR only				
3.1.1-75	PWR only				
3.1.1-76	PWR only				
3.1.1-77	PWR only				
3.1.1-78	PWR only				

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-79	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," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material in stainless steel and nickel-alloy reactor coolant pressure boundary components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.
3.1.1-80	PWR only				
3.1.1-81	PWR only				
3.1.1-82	PWR only				
3.1.1-83	PWR only				
3.1.1-84	Steel top head enclosure (without cladding) top head nozzles (vent, top head spray or RCIC, and spare) exposed to reactor coolant	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 in steel reactor vessel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-85	Stainless steel, nickel-alloy, and steel with nickel-alloy or stainless steel cladding reactor vessel flanges, nozzles, penetrations, safe ends, vessel shells, heads and welds exposed to reactor coolant	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 in stainless steel, nickel-alloy, and steel with stainless steel cladding reactor vessel components is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.
3.1.1-86	PWR only				
3.1.1-87	This line is not in NUREG-1800				
3.1.1-88	PWR only				
3.1.1-89	PWR only				
3.1.1-90	PWR only				
3.1.1-91	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 (BWR)	Chapter XI.M3, “Reactor Head Closure Stud Bolting”	No	Consistent with NUREG-1801. Cracking and loss of material in closure head stud assembly components is managed by the Reactor Head Closure Studs Program.
3.1.1-92	PWR only				

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-93	PWR only				
3.1.1-94	Stainless steel and nickel alloy vessel shell attachment welds exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M4, “BWR Vessel [Inside Diameter] ID Attachment Welds,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801. The BWR Vessel ID Attachment Welds and Water Chemistry Control – BWR Programs manage cracking in stainless steel vessel attachment welds exposed to reactor coolant.
3.1.1-95	Steel (with or without stainless steel cladding) feedwater nozzles exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M5, “BWR Feedwater Nozzle”	No	Consistent with NUREG-1801. The BWR Feedwater Nozzle Program manages cracking in the low alloy steel feedwater nozzles exposed to reactor coolant.
3.1.1-96	Steel (with or without stainless steel cladding) control rod drive return line nozzles exposed to reactor coolant	Cracking due to cyclic loading	Chapter XI.M6, “BWR Control Rod Drive Return Line Nozzle”	No	This item was not used. The GGNS control rod drive return line was cut and capped before initial plant operation. The nozzles have not been exposed to thermal cyclic loading from operation of the return line.

Table 3.1.1: Reactor Coolant System					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.1.1-97	Stainless steel and nickel alloy piping, piping components, and piping elements greater than or equal to 4 NPS; nozzle safe ends and associated welds	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M7, “BWR Stress Corrosion Cracking,” and Chapter XI.M2, “Water Chemistry”	No	Cracking in stainless steel, nickel alloy and steel clad with stainless steel components in reactor coolant is managed by a combination of several programs. Consistent with NUREG-1801 for some components of the reactor vessel and reactor coolant pressure boundary, the BWR Stress Corrosion Cracking and Water Chemistry Control – BWR Programs, further supplemented by the Inservice Inspection Program for some components, manage cracking. For other components, to which the BWR Stress Corrosion Cracking Program is not applicable, cracking is managed by the Water Chemistry Control – BWR Program and either the Inservice Inspection or BWR CRD Return Line Nozzle Program.
3.1.1-98	Stainless steel or nickel alloy penetrations: instrumentation and standby liquid control exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, cyclic loading	Chapter XI.M8, “BWR Penetrations,” and Chapter XI.M2, “Water Chemistry”	No	Cracking in stainless steel and nickel alloy nozzles and penetrations in the reactor vessel is managed by the Water Chemistry Control – BWR Program and either the BWR Penetrations or BWR Vessel Internals Program.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-99	Cast austenitic stainless steel; PH martensitic stainless steel; martensitic stainless steel; X-750 alloy reactor internal components exposed to reactor coolant and neutron flux	Loss of fracture toughness due to thermal aging and neutron irradiation embrittlement	Chapter XI.M9, "BWR Vessel Internals"	No	Consistent with NUREG-1801 for CASS components. The BWR Vessel Internals Program manages reduction of fracture toughness for CASS components. For X-750 (nickel alloy) components, the BWR Vessel Internals Program will manage reduction of fracture toughness as necessary, using future BWRVIP program guidance. Martensitic stainless steels are not used in the GGNS vessel internals.
3.1.1-100	Stainless steel reactor vessel internals components (jet pump wedge surface) exposed to reactor coolant	Loss of material due to wear	Chapter XI.M9, “BWR Vessel Internals”	No	Consistent with NUREG-1801. The BWR Vessel Internals Program manages wear of the jet pump wedges.
3.1.1-101	Stainless steel steam dryers exposed to reactor coolant	Cracking due to flow-induced vibration	Chapter XI.M9, “BWR Vessel Internals” for steam dryer	No	Consistent with NUREG-1801. The BWR Vessel Internals Program, supplemented by the Water Chemistry Control – BWR Program, manages cracking of the stainless steel steam dryer.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-102	Stainless steel fuel supports and control rod drive assemblies control rod drive housing exposed to reactor coolant	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M9, “BWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801. The BWR Vessel Internals and Water Chemistry Control – BWR Programs manage cracking of the stainless steel fuel supports and control rod guide components.
3.1.1-103	Stainless steel and nickel alloy reactor internal components exposed to reactor coolant and neutron flux	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking, irradiation-assisted stress corrosion cracking	Chapter XI.M9, “BWR Vessel Internals,” and Chapter XI.M2, “Water Chemistry”	No	Consistent with NUREG-1801. The BWR Vessel Internals and Water Chemistry Control – BWR Programs manage cracking of the stainless steel and nickel alloy reactor internals components.
3.1.1-104	X-750 alloy reactor vessel internal components exposed to reactor coolant and neutron flux	Cracking due to intergranular stress corrosion cracking	Chapter XI.M9, “BWR Vessel Internals” for core plate, and Chapter XI.M2, “Water Chemistry”	No	This item was not used. The GGNS vessel internals do not have X-750 alloy core plate components.

Table 3.1.1: Reactor Coolant System

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.1.1-105	Steel piping, piping components and piping element exposed to concrete	None	None, provided 1) attributes of the concrete are consistent with [American Concrete Institute] ACI 318 or ACI 349 (low water-to-cement ratio, low permeability, and adequate air entrainment) as cited in NUREG-1557, and 2) plant [operating experience] OE indicates no degradation of the concrete	No, if conditions are met.	This item was not used. No steel 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	[Not Applicable] 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**
3.1.1-107	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.

Notes for Table 3.1.2-1 through Table 3.1.2-4-2

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

101. The One-Time Inspection Program will verify effectiveness of the Water Chemistry Control – BWR Program.

102. High component surface temperature precludes moisture accumulation that could result in corrosion.

103. The loss of material is a potential aging effect for carbon steel surfaces in air where the surface temperatures are below the local dew point.

104. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

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, Structural support	Carbon steel, stainless steel, nickel alloy, carbon steel clad with stainless steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.A1.R-04	3.1.1-7	A
Reactor vessel closure bolting • Closure head studs, nuts, washers and bushings • Upper head nozzle flange bolting • CRD flange bolting • Incore housing bolting • Vibration instrument flange bolting	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.A1.RP-201	3.1.1-1	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**
Reactor vessel external attachments • Support skirt	Structural support	Low-alloy steel, carbon steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.A1.R-70	3.1.1-4	A
Attachments and Supports								
Reactor vessel external attachments • Support skirt • Stabilizer attachment brackets	Structural support	Low-alloy steel, carbon steel	Air – indoor (ext)	Loss of material	Inservice Inspection	--	--	H
Reactor vessel internal attachment welds • Core spray brackets • Dryer support brackets • Feedwater sparger brackets • Guide rod brackets • Jet pump pads • Surveillance specimen brackets	Structural support	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101

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 internal attachment welds • Core spray brackets • Dryer support brackets • Feedwater sparger brackets • Guide rod brackets • Jet pump pads • Surveillance specimen brackets	Structural support	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel ID Attachment Welds Water Chemistry Control – BWR	IV.A1.R-64	3.1.1-94	A
Reactor vessel internal attachment welds • Dryer holddown brackets	Structural support	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101

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
Bolting								
Incore housing bolting • CRD flange bolting • Upper head nozzle flange bolting • Vibration instrument flange bolting	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Cracking	Bolting Integrity	V.E.E-03	3.2.1-12	C
Incore housing bolting • CRD flange bolting • Upper head nozzle flange bolting • Vibration instrument flange bolting	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	C
Reactor vessel closure flange bolting • Closure studs, nuts, washers and bushings	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Loss of material	Reactor Head Closure Studs	IV.A1.RP-165	3.1.1-91	B

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 closure flange bolting • Closure studs, nuts, washers and bushings	Pressure boundary	High-strength low-alloy steel	Air – indoor (ext)	Cracking	Reactor Head Closure Studs	IV.A1.RP-51	3.1.1-91	B
Nozzles and Penetrations								
CRD housings	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
CRD housings	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	C
CRD housings	Pressure boundary	Stainless steel, nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03 IV.E.RP-04	3.1.1-106 3.1.1-107	A A
Incore housings	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Incore housings	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.A1.RP-369	3.1.1-98	E

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
Incore housings	Pressure boundary	Stainless steel, nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03 IV.E.RP-04	3.1.1-106 3.1.1-107	A A
Nozzles • Recirc outlet (N1) • Recirc inlet (N2) • Main steam (N3) • Feedwater (N4) • Core spray (N5) • RHR/LPCI (N6) • Head vent (N7) • Spare (N8) • Jet pump instrument • (N9) • CRD return (N10) • Drain (N15) • Vibration instrument (N16)	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101

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
Nozzles • Recirc outlet (N1) • Recirc inlet (N2) • Main steam (N3) • Feedwater (N4) • Core spray (N5) • RHR/LPCI (N6) • Head vent (N7) • Spare (N8) • Jet pump instrument • (N9) • CRD return (N10) • Drain (N15) • Vibration instrument (N16)	Pressure boundary	Low-alloy steel	Air – indoor (ext)	None	None	--	--	G, 102
Nozzles • Feedwater (N4)	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101
Nozzles • Feedwater (N4)	Pressure boundary	Low-alloy steel	Treated water (int)	Cracking	BWR Feedwater Nozzle	IV.A1.R-65	3.1.1-95	A
Nozzles • Feedwater (N4)	Pressure boundary	Low-alloy steel	Air – indoor (ext)	None	None	--	--	G, 102

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**
Nozzles • Core plate pressure/SLC (N11, N18)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Nozzles • Core plate pressure/SLC (N11, N18)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1.RP-369	3.1.1-98	A
Nozzles • Core plate pressure/SLC (N11, N18)	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Nozzles • Seal leak detection (N17)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Nozzles • Seal leak detection (N17)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1.R-61	3.1.1-16	E
Nozzles • Seal leak detection (N17)	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	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
Nozzles • Instrumentation (N12, N13, N14)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Nozzles • Instrumentation (N12, N13, N14)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1.RP-369	3.1.1-98	A
Nozzles • Instrumentation (N12, N13, N14)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Safe Ends, Thermal Sleeves, Flanges, Caps and Welds								
CRD return line cap and weld (N10)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
CRD return line cap and weld (N10)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	BWR CRD Return Line Nozzle Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	E
CRD return line cap and weld (N10)	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	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 flanges • Vent/spray nozzle (N7) • Spare head nozzle (N8) • Vibration instrument (N16)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101
Nozzle flanges • Vent/spray nozzle (N7) • Spare head nozzle (N8) • Vibration instrument (N16)	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Nozzle safe ends ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101

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 safe ends ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	A
Nozzle safe ends ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Nozzle safe ends and extensions ≥ 4” • Steam outlet (N3) • Feedwater inlets (N4) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101

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 safe ends and extensions ≥ 4" • Steam outlet (N3) • Feedwater inlets (N4) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Low-alloy steel	Air – indoor (ext)	None	None	--	--	G, 102
Nozzle safe ends and extensions ≥ 4" • Recirculation outlet (N1) • Recirculation inlet (N2) • Jet pump instruments (N9)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Nozzle safe ends and extensions ≥ 4" • Recirculation outlet (N1) • Recirculation inlet (N2) • Jet pump instruments (N9)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	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 safe ends and extensions ≥ 4” • Recirculation outlet (N1) • Recirculation inlet (N2) • Jet pump instruments (N9)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Nozzle safe ends < 4” • Core plate ΔP (N11, N18)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Nozzle safe ends < 4” • Core plate ΔP (N11, N18)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1.RP-369	3.1.1-98	A
Nozzle safe ends < 4” • Core plate ΔP (N11, N18)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Nozzle safe end < 4” • CRD return line (N10)	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101

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 safe end < 4" • CRD return line (N10)	Pressure boundary	Low-alloy steel	Air – indoor (ext)	None	None	--	--	G, 102
Thermal sleeves ≥ 4" • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Thermal sleeves ≥ 4" • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	A
Thermal sleeve extensions ≥ 4" • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101

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
Thermal sleeve extensions ≥ 4” • Recirculation inlets (N2) • Core spray inlets (N5) • RHR/LPCI (N6)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	A
Welds • Recirc outlet (N1)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Welds • Recirc outlet (N1)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	BWR Stress Corrosion Cracking Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	A
Welds • Recirc outlet (N1)	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Welds • Jet pump instrument (N9) • Instruments (N12, N13, N14)	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101

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**
Welds • Jet pump instrument (N9) • Instruments (N12, N13, N14)	Pressure boundary	Nickel alloy	Treated water (int)	Cracking	BWR Penetrations Water Chemistry Control – BWR	IV.A1.RP-369	3.1.1-98	A
Welds • Jet pump instrument (N9) • Instruments (N12, N13, N14)	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-03	3.1.1-106	A
Shell and Heads								
Reactor vessel bottom head	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Reactor vessel bottom head	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	E
Reactor vessel bottom head	Pressure boundary	Low-alloy steel clad with stainless steel	Air – indoor (ext)	None	None	--	--	G, 102

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 shell • Closure flange	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Reactor vessel shell • Closure flange	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	E
Reactor vessel shell • Closure flange	Pressure boundary	Low-alloy steel clad with stainless steel	Air – indoor (ext)	None	None	--	--	G, 102
Reactor vessel shell • Beltline shell rings and connecting welds	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Reactor vessel shell • Beltline shell rings and connecting welds	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	E
Reactor vessel shell • Beltline shell rings and connecting welds	Pressure boundary	Low-alloy steel clad with stainless steel	Neutron fluence	Reduction of fracture toughness	Reactor Vessel Surveillance TLAA – neutron fluence	IV.A1.RP-227 IV.A1.R-62	3.1.1-14 3.1.1-13	A 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**
Reactor vessel shell • Beltline shell rings and connecting welds	Pressure boundary	Low-alloy steel clad with stainless steel	Air – indoor (ext)	None	None	--	--	G, 102
Reactor vessel shell • Non-beltline shell rings	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Reactor vessel shell • Non-beltline shell rings	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	E
Reactor vessel shell • Non-beltline shell rings	Pressure boundary	Low-alloy steel clad with stainless steel	Air – indoor (ext)	None	None	--	--	G, 102
Reactor vessel upper head • Closure flange	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-157	3.1.1-85	A, 101
Reactor vessel upper head • Closure flange	Pressure boundary	Low-alloy steel clad with stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.A1.R-68	3.1.1-97	E

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 upper head • Closure flange	Pressure boundary	Low-alloy steel clad with stainless steel	Air – indoor (ext)	None	None	--	--	G, 102
Reactor vessel upper head • Top head (dome)	Pressure boundary	Low-alloy steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.A1.RP-50	3.1.1-84	A, 101
Reactor vessel upper head • Top head (dome)	Pressure boundary	Low-alloy steel	Air – indoor (ext)	None	None	--	--	G, 102

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
RV internals	Structural support, Flow distribution, Floodable volume	Stainless steel, nickel alloy	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.B1.R-53	3.1.1-3	A
Control rod guide tubes • Tube, thermal sleeve	Structural support	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Control rod guide tubes • Tube, thermal sleeve	Structural support	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	A
Control rod guide tubes • Base	Structural support	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101

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 tubes • Base	Structural support	CASS	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	A
Control rod guide tubes • Base	Structural support	CASS	Treated water > 482ºF (int)	Reduction of fracture toughness	BWR Vessel Internals	IV.B1.RP-220	3.1.1-99	A
Core plate assembly	Structural support	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Core plate assembly	Structural support	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-93	3.1.1-103	A
Core spray lines and spargers	Flow distribution	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Core spray lines and spargers	Flow distribution	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-99	3.1.1-103	A
Fuel supports • Four-lobe	Structural support	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101

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
Fuel supports • Four-lobe	Structural support	CASS	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	A
Fuel supports • Four-lobe	Structural support	CASS	Treated water > 482ºF and neutron fluence	Reduction of fracture toughness	BWR Vessel Internals	IV.B1.RP-220	3.1.1-99	A
Fuel supports • Peripheral	Structural support	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Fuel supports • Peripheral	Structural support	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	A
Fuel support orifices	Flow distribution	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Fuel support orifices	Flow distribution	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-104	3.1.1-102	A
In-core • Guide tubes	Structural support	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101

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**
In-core • Guide tubes	Structural support	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-105	3.1.1-103	A
In-core • Dry tubes	Pressure boundary	Stainless steel	Treated water > 140ºF (ext)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
In-core • Dry tubes	Pressure boundary	Stainless steel	Treated water > 140ºF (ext)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.B1.R-105	3.1.1-103	E
In-core • Dry tubes	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	C
Jet pump assemblies • Riser pipe/ elbow/brace • Suction inlet sleeve • Hold-down bolt • Diffuser shell	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101

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
Jet pump assemblies • Riser pipe/ elbow/brace • Suction inlet sleeve • Hold-down bolt • Diffuser shell	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-100	3.1.1-103	A
Jet pump assemblies • Restrainer bracket wedge assemblies	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Jet pump assemblies • Restrainer bracket wedge assemblies	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Loss of material – wear	BWR Vessel Internals	IV.B1.RP-377	3.1.1-100	A
Jet pump assemblies • Restrainer bracket wedge assemblies	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-100	3.1.1-103	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**
Jet pump assemblies • Hold-down beam • Diffuser adapter (lower ring)	Floodable volume	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Jet pump assemblies • Hold-down beam • Diffuser adapter (lower ring)	Floodable volume	Nickel alloy	Treated water (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-100	3.1.1-103	A
Jet pump assemblies • Transition piece • Suction inlet elbow/nozzle • Mixer adapter and throat (barrel) • Restrainer bracket • Diffuser collar and tailpipe	Floodable volume	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101

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
Jet pump assemblies • Transition piece • Suction inlet elbow/nozzle • Mixer adapter and throat (barrel) • Restrainer bracket • Diffuser collar and tailpipe	Floodable volume	CASS	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-100	3.1.1-103	A
Jet pump assemblies • Transition piece • Suction inlet elbow/nozzle • Mixer adapter and throat (barrel) • Restrainer bracket • Diffuser collar and tailpipe	Floodable volume	CASS	Treated water > 482ºF and neutron fluence	Reduction of fracture toughness	BWR Vessel Internals	IV.B1.RP-219	3.1.1-99	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
Low pressure coolant injection (LPCI) lines • Shroud attachment ring • Collar • Sleeve • Fitting • Elbow extension	Floodable volume	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Low pressure coolant injection (LPCI) lines • Shroud attachment ring • Collar • Sleeve • Fitting • Elbow extension	Floodable volume	CASS	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-97	3.1.1-103	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**
Low pressure coolant injection (LPCI) lines • Shroud attachment ring • Collar • Sleeve • Fitting • Elbow extension	Floodable volume	CASS	Treated water > 482ºF and neutron fluence	Reduction of fracture toughness	BWR Vessel Internals	IV.B1.RP-220	3.1.1-99	A
Low pressure coolant injection (LPCI) lines • Strut • Elbow • Flow diverter	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Low pressure coolant injection (LPCI) lines • Strut • Elbow • Flow diverter	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-97	3.1.1-103	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
Low pressure coolant injection (LPCI) lines • Seal/piston ring	Floodable volume	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Low pressure coolant injection (LPCI) lines • Seal/piston ring	Floodable volume	Nickel alloy	Treated water (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-96	3.1.1-103	C
Shroud	Structural support Floodable volume	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Shroud	Structural support Floodable volume	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-97	3.1.1-103	A
Shroud support	Structural support	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Shroud support	Structural support	Nickel alloy	Treated water (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-96	3.1.1-103	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**
Shroud support • Access hole cover	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Shroud support • Access hole cover	Floodable volume	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-97	3.1.1-103	C
Steam dryer	Structural integrity	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Steam dryer	Structural integrity	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.RP-155	3.1.1-101	A
Top guide assembly	Structural support	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.B1.RP-26	3.1.1-43	E, 101
Top guide assembly	Structural support	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Vessel Internals Water Chemistry Control – BWR	IV.B1.R-98	3.1.1-103	A

Table 3.1.2-3
Reactor Coolant Pressure Boundary
Summary of Aging Management Evaluation

Table 3.1.2-3: Reactor Coolant Pressure Boundary								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	IV.C1.RP-42	3.1.1-63	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	A
Bolting	Pressure boundary	Carbon steel, stainless steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.RP-44	3.1.1-11	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	A
Condensing chamber	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Condensing chamber	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection One-Time Inspection – Small-Bore Piping Water Chemistry Control – BWR	IV.C1.RP-230	3.1.1-39	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**
Condensing chamber	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Control rod drive	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Control rod drive	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	E
Control rod drive	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Flow element	Flow control	CASS	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 101
Flow element	Flow control	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Flow element	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Flow element	Pressure boundary Flow control	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	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
Flow element	Pressure boundary Flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Heat exchanger assembly	Pressure boundary	Stainless steel, nickel alloy	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	C
Heat exchanger assembly	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (ext)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	E
Heat exchanger assembly	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (ext)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Heat exchanger assembly	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – Closed Treated Water Systems	V.D2.EP-98	3.2.1-28	C
Heat exchanger assembly	Pressure boundary	Stainless steel, nickel alloy	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.D2.EP-93	3.2.1-31	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
Piping (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103
Piping (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Piping (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Piping (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Piping (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
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	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	C
Piping (non-Class 1)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Piping (non-Class 1)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Piping < 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103

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 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Piping < 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Piping < 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Piping < 4 inch NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping < 4 inch NPS	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection One-Time Inspection – Small-Bore Piping Water Chemistry Control – BWR	IV.C1.RP-230	3.1.1-39	A
Piping < 4 inch NPS	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Piping ≥ 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103
Piping ≥ 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Piping ≥ 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	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 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Piping ≥ 4 inch NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Piping ≥ 4 inch NPS	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	BWR Stress Corrosion Cracking Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	A
Piping ≥ 4 inch NPS	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Pump casing	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Pump casing	Pressure boundary	CASS	Treated water > 140ºF (int)	Cracking	BWR Stress Corrosion Cracking Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	A

Table 3.1.2-3: Reactor Coolant Pressure Boundary

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Pump casing	Pressure boundary	CASS	Treated water > 482ºF (int)	Reduction of fracture toughness	Inservice Inspection	IV.C1.R-08	3.1.1-38	A
Pump cover	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	C, 103
Pump cover	Pressure boundary	Carbon steel clad with stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	A
Pump cover	Pressure boundary	Carbon steel clad with stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Reactor coolant pressure boundary components	Pressure boundary	Carbon steel, stainless steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Restriction orifice	Pressure boundary Flow control	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**
Restriction orifice	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection One-Time Inspection – Small-Bore Piping Water Chemistry Control – BWR	IV.C1.RP-230	3.1.1-39	A
Restriction orifice	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Restriction orifice (non-Class 1)	Pressure boundary Flow control	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Restriction orifice (non-Class 1)	Pressure boundary Flow control	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	C
Restriction orifice (non-Class 1)	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Restriction orifice (non-Class 1)	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	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
Thermal sleeve (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Thermal sleeve (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Thermal sleeve (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 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 water > 140ºF (int)	Cracking	BWR Stress Corrosion Cracking Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Thermowell (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103
Thermowell (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	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
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	C
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Tubing (non-Class 1)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103
Valve body (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Valve body (non-Class 1)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Valve body (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Valve body (non-Class 1)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body (non-Class 1)	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**
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	C
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Valve body (non-Class 1)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body < 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103
Valve body < 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Valve body < 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Valve body < 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body < 4 inch NPS	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body < 4 inch NPS	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Inservice Inspection One-Time Inspection – Small-Bore Piping Water Chemistry Control – BWR	IV.C1.RP-230	3.1.1-39	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 inch NPS	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body ≥ 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C, 103
Valve body ≥ 4 inch NPS	Pressure boundary	Carbon steel	Air – indoor (ext)	None	None	--	--	G, 102
Valve body ≥ 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Valve body ≥ 4 inch NPS	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body ≥ 4 inch NPS	Pressure boundary	CASS	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Valve body ≥ 4 inch NPS	Pressure boundary	CASS	Treated water > 140ºF (int)	Cracking	BWR Stress Corrosion Cracking Inservice Inspection Water Chemistry Control – BWR	IV.C1.R-20	3.1.1-97	A
Valve body ≥ 4 inch NPS	Pressure boundary	CASS	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	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**
Valve body ≥ 4 inch NPS	Pressure boundary	CASS	Treated water > 482ºF (int)	Reduction of fracture toughness	Inservice Inspection	IV.C1.R-08	3.1.1-38	A

Table 3.1.2-4-1
Nuclear Boiler System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.1.2-4-1:Nuclear 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	IV.C1.RP-42	3.1.1-63	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A

Table 3.1.2-4-1:Nuclear 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	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101

Table 3.1.2-4-1:Nuclear 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
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	IV.C1.R-23	3.1.1-60	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101

Table 3.1.2-4-2
Reactor Recirculation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.1.2-4-2: Reactor Recirculation System Nonsafety-Related Components 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	V.E.E-44	3.1.1-40	C
Accumulator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C
Accumulator	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-77	3.2.1-49	C, 104
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	IV.C1.RP-42	3.1.1-63	A
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	A
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	IV.C1.RP-43	3.1.1-67	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.D2.EP-77	3.2.1-49	C, 104
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C

Table 3.1.2-4-2: Reactor Recirculation System Nonsafety-Related Components 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.D2.EP-77	3.2.1-49	C, 104
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
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.D2.EP-77	3.2.1-49	C, 104
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.D2.EP-77	3.2.1-49	C, 104

Table 3.1.2-4-2: Reactor Recirculation System Nonsafety-Related Components 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	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
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Tank	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 104
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	IV.E.RP-04	3.1.1-107	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	C
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 104
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	C

Table 3.1.2-4-2: Reactor Recirculation System Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-77	3.2.1-49	C, 104
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 101
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-76	3.2.1-50	C, 104
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.E3.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 – BWR	VII.E3.AP-140	3.3.1-22	C, 101
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)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 104

Table 3.1.2-4-2: Reactor Recirculation System Nonsafety-Related Components 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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 101
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	IV.C1.R-220	3.1.1-6	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	IV.C1.RP-158	3.1.1-79	A, 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[1] are addressed in this section (system descriptions are available in the referenced sections).

- Residual Heat Removal (Section 2.3.2.1)
- Low Pressure Core Spray (Section 2.3.2.2)
- High Pressure Core Spray (Section 2.3.2.3)
- Reactor Core Isolation Cooling (Section 2.3.2.4)
- Pressure Relief (Section 2.3.2.5)
- Standby Gas Treatment (Section 2.3.2.6)
- Containment Penetrations (Section 2.3.2.7)
- Miscellaneous ESF Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.2.8)

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 Residual Heat Removal System—Summary of Aging Management Evaluation
- Table 3.2.2-2 Low Pressure Core Spray System—Summary of Aging Management Evaluation
- Table 3.2.2-3 High Pressure Core Spray System—Summary of Aging Management Evaluation
- Table 3.2.2-4 Reactor Core Isolation Cooling System—Summary of Aging Management Evaluation

1. The UFSAR Section 6.0 defined set of ESF systems is different, in part, from the set of systems described in this section. To simplify the comparison of aging management review results with NUREG-1801, the ESF systems included in this section are those evaluated in NUREG-1801 Chapter V.

- Table 3.2.2-5 Pressure Relief System—Summary of Aging Management Evaluation
- Table 3.2.2-6 Standby Gas Treatment System—Summary of Aging Management Evaluation
- Table 3.2.2-7 Containment Penetrations—Summary of Aging Management Evaluation

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

- Table 3.2.2-8-1 Residual Heat Removal System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.2.2-8-2 Low Pressure Core Spray System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.2.2-8-3 High Pressure Core Spray System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.2.2-8-4 Reactor Core Isolation Cooling, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.2.2.1 Materials, Environment, 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 Residual Heat Removal

Materials

Residual heat removal system components are constructed of the following materials.

- carbon steel
- copper alloy
- stainless steel

Environment

Residual heat removal system components are exposed to the following environments.

- air – indoor
- raw water
- 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 preload

Aging Management Programs

The following aging management programs manage the effects of aging on the residual heat removal components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Service Water Integrity
- Water Chemistry Control – BWR

3.2.2.1.2 Low Pressure Core Spray

Materials

Low pressure core spray system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Low pressure core spray system components are exposed to the following environments.

- air – indoor
- treated water

Aging Effects Requiring Management

The following aging effects associated with the low pressure core spray system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the low pressure core spray system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.3 High Pressure Core Spray

Materials

High pressure core spray system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

High pressure core spray system components are exposed to the following environments.

- air – indoor
- treated water

Aging Effects Requiring Management

The following aging effects associated with the high pressure core spray system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the high pressure core spray system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.4 Reactor Core Isolation Cooling

Materials

Reactor core isolation cooling system components are constructed of the following materials.

- carbon steel
- copper alloy
- glass
- gray cast iron
- stainless steel

Environment

Reactor core isolation cooling system components are exposed to the following environments.

- air – indoor
- lube oil
- steam
- treated water

Aging Effects Requiring Management

The following aging effects associated with the reactor core isolation cooling 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 reactor core isolation cooling system components.

- Bolting Integrity
- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- Oil Analysis
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.5 Pressure Relief System

Materials

Pressure relief system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Pressure relief system components are exposed to the following environments.

- air – indoor
- steam
- treated water

Aging Effects Requiring Management

The following aging effects associated with the pressure relief system require management.

- cracking

- cracking – fatigue
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the pressure relief system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Water Chemistry Control – BWR

3.2.2.1.6 Standby Gas Treatment

Materials

Standby gas treatment system components are constructed of the following materials.

- carbon steel
- elastomer
- stainless steel

Environment

Standby gas treatment system components are exposed to the following environments.

- air – indoor
- waste water

Aging Effects Requiring Management

The following aging effects associated with the standby gas treatment system require management.

- change in material properties
- cracking
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the standby gas treatment system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components

3.2.2.1.7 Containment Penetrations

Materials

Containment penetrations components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Containment penetrations components are exposed to the following environments.

- air – indoor
- condensation
- lube oil
- steam
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the containment penetrations require management.

- cracking
- cracking – fatigue
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the effects of aging on the containment penetrations components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring

- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems

3.2.2.1.8 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 3.2.2-8-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
- stainless steel

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air – indoor
- treated water
- treated 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

- External Surfaces Monitoring
- Flow-Accelerated Corrosion
- One-Time Inspection
- Selective Leaching
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems

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 GGNS 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 PWR steel charging pump casings with stainless steel cladding and is therefore not applicable to GGNS.

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. Although this paragraph is referenced only by a PWR table line (V.D1.E-01) in NUREG-1801, it could also apply to BWR plants. However, the ESF systems at GGNS do not include partially encased stainless steel tanks exposed to this environment. Therefore, this paragraph is not applicable.

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. At GGNS, there are no ESF system components exposed to outdoor air or located near unducted air intakes. Therefore, this item was not used.

3.2.2.2.4 Loss of Material due to Erosion

This paragraph in NUREG-1800 pertains to PWR high pressure safety injection (HPSI) pump miniflow recirculation orifice and is therefore not applicable to GGNS.

3.2.2.2.5 Loss of Material due to General Corrosion and Fouling that Leads to Corrosion

This item refers to loss of material due to general corrosion and fouling occurring for steel drywell and suppression chamber spray system nozzle and flow orifice internal surfaces exposed to indoor air. At GGNS the containment spray nozzles are stainless steel and are not subject to loss of material due to general corrosion in an indoor air environment. There are no steel orifices in the containment spray subsystem of the residual heat removal system internally exposed to an indoor air environment. Therefore, this item was not used.

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. At GGNS, there are no ESF system components in the scope of license renewal that are exposed to outdoor air or located near unducted air intakes. Therefore, this item was not used.

3.2.2.2.7 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of GGNS 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	PWR only				
3.2.1-3	PWR only				
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	This item was not used. There are no ESF system components exposed to outdoor air included in the scope of license renewal. See Section 3.2.2.2.3 item 2.
3.2.1-5	PWR only				

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-6	Steel Drywell and suppression chamber spray system (internal surfaces): flow orifice; spray nozzles exposed to Air – indoor, uncontrolled (Internal)	Loss of material due to general corrosion; fouling that leads to corrosion	A plant-specific aging management program is to be evaluated	Yes, plant-specific	This item was not used. The spray nozzles of the containment spray subsystem of the residual heat removal system are stainless steel, and the system has no flow orifices exposed to indoor air. See Section 3.2.2.2.5.
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	This item was not used. There are no ESF system components exposed to outdoor air included in the scope of license renewal. See Section 3.2.2.2.6.
3.2.1-8	PWR only				
3.2.1-9	PWR only				

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	This item was not used. There are no cast austenitic stainless steel components exposed to treated water > 250°C (> 482°F) within the scope of license renewal that are outside the reactor coolant system pressure boundary.
3.2.1-11	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.
3.2.1-12	Steel, high-strength closure bolting exposed to air with steam or water leakage	Cracking due to cyclic loading, stress corrosion cracking	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Cracking of high-strength steel reactor coolant system closure bolting (Table 3.1.2-1) is managed by the Bolting Integrity Program.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-13	Steel; stainless steel bolting, closure bolting exposed to air – outdoor (external), air – indoor, uncontrolled (external)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material for steel closure bolting exposed to indoor air is managed by the Bolting Integrity Program. There is no ESF system bolting exposed to outdoor air in the scope of license renewal.
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	This item was not used. 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. Copper alloy and nickel alloy bolting is not included in the scope of license renewal for ESF systems.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-16	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	Consistent with NUREG-1801. Loss of material for steel containment isolation and other ESF system components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. For some components externally exposed to treated water, the Periodic Surveillance and Preventive Maintenance will supplement the water chemistry control program.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-17	Aluminum, stainless steel 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 stainless steel components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. There are no aluminum ESF system components exposed to treated water in the scope of license renewal. For some components externally exposed to treated water, the Periodic Surveillance and Preventive Maintenance Program will supplement the water chemistry control program.
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 – BWR 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
3.2.1-19	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Fouling of stainless steel heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage fouling.
3.2.1-20	PWR only				
3.2.1-21	PWR only				
3.2.1-22	PWR only				
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	PWR only				

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 components exposed to raw water is managed by the Service Water Integrity Program.
3.2.1-26	Stainless steel heat exchanger tubes exposed to raw water	Reduction of heat transfer due to fouling	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Fouling of stainless steel heat exchanger tubes exposed to raw water is managed by the Service Water Integrity Program.
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	This item was not used. There are no steel ESF system heat exchanger tubes exposed to raw water in the scope of license renewal.

Table 3.2.1: Engineered Safety Features					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.2.1-28	Stainless steel piping, piping components, and piping elements exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	The Water Chemistry Control – Closed Treated Water Systems Program, supplemented by the Inservice Inspection Program, manages cracking of reactor recirculation pump heat exchanger assembly subcomponents (Table 3.1.2-3) exposed to closed-cycle cooling water > 60°C (> 140°F). There are no ESF system components exposed to closed-cycle cooling water > 60°C (> 140°F) in the scope of license renewal.
3.2.1-29	Steel Piping, piping components, and piping elements exposed to closed-cycle cooling water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	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	This item was not used. There are no steel ESF system heat exchanger 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
3.2.1-31	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.
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	Consistent with NUREG-1801. Loss of material of copper alloy heat exchanger components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
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	This item was not used. There are no copper alloy or stainless steel ESF system heat exchanger tubes exposed to closed-cycle cooling water with an intended function of heat transfer 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
3.2.1-34	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	This item was not used. There are no copper alloy (> 15% Zn or > 8% Al) ESF system components exposed to closed-cycle cooling water in the scope of license renewal.
3.2.1-35	PWR only				
3.2.1-36	PWR only				
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	This item was not used. There are no ESF system components exposed to soil in the scope of license renewal.
3.2.1-38	Elastomers, elastomer seals and components exposed to air – indoor, uncontrolled (external)	Hardening and loss of strength due to elastomer degradation	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Consistent with NUREG-1801. Degradation of elastomer components externally exposed to indoor air 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
3.2.1-39	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.
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	This item was not used. There are no ESF system components exposed to outdoor 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**
3.2.1-42	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	This item was not used. There are no ESF system components exposed to outdoor air in the scope of license renewal.
3.2.1-43	Elastomers elastomer seals and components exposed to air – indoor, uncontrolled (internal)	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. Degradation of elastomer components internally exposed to indoor air is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
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. 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.
3.2.1-45	PWR only				
3.2.1-46	Steel piping and components (internal surfaces) 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	This item was not used. There are no steel ESF system components exposed to internal condensation in the scope of license renewal.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-47	PWR only				
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 (Tables 3.3.2-XX) 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 (PWR only) 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.

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 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. There are no steel ESF system heat exchanger tubes with an intended function of heat transfer in the scope of license renewal.
3.2.1-52	Steel (with coating or wrapping) piping, piping components, and piping elements exposed to soil or concrete	Loss of material due to general, pitting, crevice, and microbiologically-influenced corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	This item was not used. There are no ESF system components exposed to soil or concrete in the scope of license renewal.
3.2.1-53	Stainless steel 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	This item was not used. There are no ESF system components exposed to soil or concrete in the scope of license renewal.

Table 3.2.1: Engineered Safety Features

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.2.1-53.5	Steel; stainless steel 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	This item was not used. There are no underground ESF system components in the scope of license renewal.
3.2.1-54	Stainless steel piping, piping components, and piping elements exposed to treated water >60°c (>140°f)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M7, “BWR Stress Corrosion Cracking,” and Chapter XI.M2, “Water Chemistry”	No	This item was not used. Stainless steel components of the ESF systems subject to evaluation under the BWR Stress Corrosion Cracking Program were reviewed as part of the Class 1 reactor coolant pressure boundary (Table 3.1.2-3).
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.	This item was not used. 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	This item was not used. 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 for copper alloy components exposed to indoor air. There are no copper alloy ESF system components exposed to gas in the scope of license renewal.
3.2.1-58	PWR only				
3.2.1-59	Galvanized steel ducting, piping, and components exposed to air – indoor, controlled (external)	None	None	NA - No AEM or AMP	This item was not used. 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	This item was not used. 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	This item was not used. 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. There are no stainless steel ESF system components exposed to air with borated water leakage, concrete, or gas 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	This item was not used. There are no steel ESF system components exposed to controlled indoor air or gas in the scope of license renewal.

Notes for Table 3.2.2-1 through Table 3.2.2-8-4

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

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 – BWR Program.

202. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

203. This treated water is equivalent to the NUREG-1801 raw water (potable) environment.

Table 3.2.2-1
Residual Heat Removal System
Summary of Aging Management Evaluation

Table 3.2.2-1: 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 preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 201
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	3.2.1-15	A
Cyclone separator	Pressure boundary Filtration	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-1: Residual Heat Removal System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Cyclone separator	Pressure boundary Filtration	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Cyclone separator	Pressure boundary Filtration	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Cyclone separator	Pressure boundary Filtration	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Flow element	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Flow element	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Flow element	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-1: 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 (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2.EP-90	3.2.1-23	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	Raw water (int)	Loss of material	Service Water Integrity	V.D2.EP-90	3.2.1-23	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 201
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 201
Heat exchanger (tube sheets)	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 sheets)	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	V.D2.EP-91	3.2.1-25	A

Table 3.2.2-1: 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 sheets)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VII.E3.AP-112	3.3.1-20	C, 201
Heat exchanger (tube sheets)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
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)	Heat transfer	Copper alloy	Treated water (ext)	Fouling	Water Chemistry Control – BWR	VIII.E.SP-100	3.4.1-18	C, 201
Heat exchanger (tubes)	Heat transfer	Stainless steel	Raw water (ext)	Fouling	Service Water Integrity	V.D2.E-21	3.2.1-26	A
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water > 140ºF (int)	Fouling	Water Chemistry Control – BWR	V.D2.EP-74	3.2.1-19	A, 201
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)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-140	3.3.1-22	C, 201

Table 3.2.2-1: 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	Raw water (ext)	Loss of material	Service Water Integrity	V.D2.EP-91	3.2.1-25	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	V.D2.EP-91	3.2.1-25	A
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140ºF (ext)	Cracking	Water Chemistry Control – BWR	VII.E3.AP-112	3.3.1-20	C, 201
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140ºF (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VII.E3.AP-112	3.3.1-20	C, 201
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Nozzle	Flow control	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Nozzle	Flow control	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-1: Residual Heat Removal 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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Orifice	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary Flow control	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	A
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2.EP-60	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	A

Table 3.2.2-1: 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	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-09	3.2.1-11	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (ext)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201

Table 3.2.2-1: Residual Heat Removal 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Pump casing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Suction barrel	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Suction barrel	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	A
Suction barrel	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	A

Table 3.2.2-1: Residual Heat Removal System

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)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-1: Residual Heat Removal 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.D2.E-29	3.2.1-44	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-09	3.2.1-11	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-2
Low Pressure Core Spray System
Summary of Aging Management Evaluation

Table 3.2.2-2: Low Pressure Core 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 preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 201
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	3.2.1-15	A
Cyclone separator	Pressure boundary Filtration	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-2: Low Pressure Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Cyclone separator	Pressure boundary Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2.EP-60	3.2.1-16	E

Table 3.2.2-2: Low Pressure Core 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	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Pump casing	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-2: Low Pressure Core Spray 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Suction barrel	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Suction barrel	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-3
High Pressure Core Spray System
Summary of Aging Management Evaluation

Table 3.2.2-3: High Pressure Core 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 preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 201
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	3.2.1-15	A
Cyclone separator	Pressure boundary Filtration	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-3: High Pressure Core Spray System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Cyclone separator	Pressure boundary Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2.EP-60	3.2.1-16	E

Table 3.2.2-3: High Pressure Core 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	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Pump casing	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-3: High Pressure Core Spray 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	V.E.E-44	3.2.1-40	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Suction barrel	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Suction barrel	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-3: High Pressure Core Spray 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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-4
Reactor Core Isolation Cooling System
Summary of Aging Management Evaluation

Table 3.2.2-4: Reactor Core Isolation 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	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	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 201
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of preload	Bolting Integrity	V.E.EP-122	3.2.1-15	A
Cyclone separator	Pressure boundary Filtration	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-4: Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Cyclone separator	Pressure boundary Filtration	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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.D2.EP-77	3.2.1-49	A, 202
Filter housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Filter housing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-77	3.2.1-49	A, 202
Flange	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Flange	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-4: Reactor Core Isolation Cooling System

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	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	C
Heat exchanger (bonnet)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
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.D2.EP-77	3.2.1-49	C, 202
Heat exchanger (tube sheets)	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Heat exchanger (tube sheets)	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 202
Heat exchanger (tube sheets)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
Heat exchanger (tubes)	Heat transfer	Stainless steel	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-79	3.2.1-51	A, 202

Table 3.2.2-4: Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Fouling	Water Chemistry Control – BWR	V.D2.EP-74	3.2.1-19	A, 201
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.C1.AP-138	3.3.1-100	C, 202
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	C, 201
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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Orifice	Pressure boundary Flow control	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 202

Table 3.2.2-4: Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Orifice	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 201
Orifice	Pressure boundary Flow control	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Orifice	Pressure boundary Flow control	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 201
Orifice	Pressure boundary Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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.D2.EP-77	3.2.1-49	A, 202
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-07	3.2.1-11	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201

Table 3.2.2-4: Reactor Core Isolation 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 (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2.EP-60	3.2.1-16	E
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Pump casing	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-77	3.2.1-49	A, 202
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-4: Reactor Core Isolation Cooling 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	V.D2.EP-77	3.2.1-49	A, 202
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	V.F.EP-15	3.2.1-60	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	V.F.EP-16	3.2.1-60	A
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Strainer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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.D2.EP-77	3.2.1-49	C, 202

Table 3.2.2-4: Reactor Core Isolation Cooling 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	Steam (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-07	3.2.1-11	C
Tank	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	C, 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 water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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.D2.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	Lube oil (int)	Cracking	Oil Analysis	--	--	H
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 202
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 201

Table 3.2.2-4: Reactor Core Isolation Cooling System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 201
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Turbine casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Turbine casing	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201
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.D2.EP-77	3.2.1-49	A, 202
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Valve body	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	A

Table 3.2.2-4: Reactor Core Isolation 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	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-76	3.2.1-50	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	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, 202
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-5
Pressure Relief System
Summary of Aging Management Evaluation

Table 3.2.2-5: Pressure Relief 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 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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Piping	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2.EP-60	3.2.1-16	E

Table 3.2.2-5: Pressure Relief 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 (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	V.D2.EP-73	3.2.1-17	E
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Quencher	Pressure boundary Flow control	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Quencher	Pressure boundary Flow control	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201
Quencher	Pressure boundary Flow control	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
Quencher	Pressure boundary Flow control	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201

Table 3.2.2-5: Pressure Relief 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	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Thermowell	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 201
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 201
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 201
Valve body	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: Pressure Relief 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.D2.E-29	3.2.1-44	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 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	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 201
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 201

Table 3.2.2-6
Standby Gas Treatment System
Summary of Aging Management Evaluation

Table 3.2.2-6: Standby Gas Treatment 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	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	V.E.EP-69	3.2.1-15	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	A
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	V.B.EP-59	3.2.1-38	A

Table 3.2.2-6: Standby Gas Treatment 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 (ext)	Cracking	External Surfaces Monitoring	V.B.EP-59	3.2.1-38	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.EP-58	3.2.1-43	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.EP-58	3.2.1-43	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.B.E-26	3.2.1-40	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.B.E-26	3.2.1-40	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-6: Standby Gas Treatment 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	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Filter unit housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A
Filter unit housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	A
Moisture Separator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Moisture Separator	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.B.E-26	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.B.E-25	3.2.1-44	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	V.F.EP-18	3.2.1-63	A

Table 3.2.2-6: Standby Gas Treatment 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 (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
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
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.B.E-26	3.2.1-40	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	A
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.2.2-7
Containment Penetrations
Summary of Aging Management Evaluation

Table 3.2.2-7: 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
Flow element	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.C.E-35	3.2.1-40	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C.EP-62	3.2.1-16	A, 201
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	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 202

Table 3.2.2-7: 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	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.D2.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
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C.EP-62	3.2.1-16	A, 201
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.C.EP-99	3.2.1-39	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A

Table 3.2.2-7: 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	Stainless steel	Air – indoor (int)	None	None	V.F.EP-82	3.2.1-63	A
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Piping	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 202
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 203
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C.EP-63	3.2.1-18	A, 201
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.C.EP-95	3.2.1-31	A
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

Table 3.2.2-7: Containment Penetrations

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
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.C.E-35	3.2.1-40	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.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	Lube oil (int)	Loss of material	Oil Analysis	V.D2.EP-77	3.2.1-49	C, 202
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C.EP-62	3.2.1-16	A, 201
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

Table 3.2.2-7: 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	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	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)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 202
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 203
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.C.EP-63	3.2.1-18	A, 201
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.C.EP-95	3.2.1-31	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.2.2-7: 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	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.C.EP-63	3.2.1-18	A, 201

Table 3.2.2-8-1
Residual Heat Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-8-1: 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	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
Coil	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	A
Coil	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	V.D2.EP-94	3.2.1-32	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-09	3.2.1-11	A

Table 3.2.2-8-1: 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
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-140	3.3.1-22	C, 201
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	V.F.EP-18	3.2.1-63	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-8-1: 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
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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-09	3.2.1-11	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 201
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201

Table 3.2.2-8-2
Low Pressure Core Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-8-2: Low Pressure Core 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	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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201

Table 3.2.2-8-3
High Pressure Core Spray System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-8-3: High Pressure Core 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	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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201

Table 3.2.2-8-3: High Pressure Core 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
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	V.F.EP-10	3.2.1-57	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.E3.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 – BWR	VII.E3.AP-140	3.3.1-22	C, 201

Table 3.2.2-8-4
Reactor Core Isolation Cooling
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.2.2-8-4: Reactor Core Isolation Cooling, Nonsafety-Related Components 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 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
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	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	V.D2.E-09	3.2.1-11	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-73	3.2.1-17	A, 201
Trap	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	V.E.E-44	3.2.1-40	A

Table 3.2.2-8-4: Reactor Core Isolation Cooling, Nonsafety-Related Components 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	V.D2.EP-60	3.2.1-16	A, 201

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).

- Control Rod Drive (Section 2.3.3.1)
- Standby Liquid Control (Section 2.3.3.2)
- Suppression Pool Makeup (Section 2.3.3.3)
- Leakage Detection and Control (Section 2.3.3.4)
- Combustible Gas Control (Section 2.3.3.5)
- Fuel Pool Cooling and Cleanup (Section 2.3.3.6)
- Standby Service Water (Section 2.3.3.7)
- Component Cooling Water (Section 2.3.3.8)
- Plant Service Water (Section 2.3.3.9)
- Floor and Equipment Drainage (Section 2.3.3.10)
- Compressed Air (Section 2.3.3.11)
- Fire Protection – Water (Section 2.3.3.12)
- Fire Protection – Halon and CO_2 (Section 2.3.3.13)
- Plant Chilled Water (Section 2.3.3.14)
- Standby Diesel Generator (Section 2.3.3.15)
- HPCS Diesel Generator (Section 2.3.3.16)
- Control Room Heating, Ventilation, and Air Conditioning (Section 2.3.3.17)
- Heating, Ventilation and Air Conditioning (Section 2.3.3.18)
- Miscellaneous Auxiliary Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.3.19)

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 Control Rod Drive System—Summary of Aging Management Evaluation
- Table 3.3.2-2 Standby Liquid Control System—Summary of Aging Management Evaluation
- Table 3.3.2-3 Suppression Pool Makeup System—Summary of Aging Management Evaluation

- Table 3.3.2-4 Leakage Detection and Control System—Summary of Aging Management Evaluation
- Table 3.3.2-5 Combustible Gas Control System—Summary of Aging Management Evaluation
- Table 3.3.2-6 Fuel Pool Cooling and Cleanup System—Summary of Aging Management Evaluation
- Table 3.3.2-7 Standby Service Water System—Summary of Aging Management Evaluation
- Table 3.3.2-8 Component Cooling Water System—Summary of Aging Management Evaluation
- Table 3.3.2-9 Plant Service Water System—Summary of Aging Management Evaluation
- Table 3.3.2-10 Floor and Equipment Drainage—Summary of Aging Management Evaluation
- Table 3.3.2-11 Compressed Air Systems—Summary of Aging Management Evaluation
- Table 3.3.2-12 Fire Protection – Water System—Summary of Aging Management Evaluation
- Table 3.3.2-13 Fire Protection – Halon and CO_2 Systems—Summary of Aging Management Evaluation
- Table 3.3.2-14 Plant Chilled Water System—Summary of Aging Management Evaluation
- Table 3.3.2-15 Standby Diesel Generator System—Summary of Aging Management Evaluation
- Table 3.3.2-16 HPCS Diesel Generator System—Summary of Aging Management Evaluation
- Table 3.3.2-17 Control Room Heating, Ventilation, and Air Conditioning System—Summary of Aging Management Evaluation
- Table 3.3.2-18 Heating, Ventilation and Air Conditioning System—Summary of Aging Management Evaluation

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

- Table 3.3.2-19-1 CRD Hydraulic System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-2 Standby Liquid Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-3 Process Radiation Monitoring System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-4 Leak Detection System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-5 MSIV – Leakage Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-6 Combustible Gas Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-7 Reactor Water Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-8 Fuel Pool Cooling and Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-9 CRD Maintenance Facility, Flush Tank Filter and Leak Test System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-10 Containment Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.3.2-19-11 Drywell Cooling System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-19-36 Control Room HVAC System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.3.2-19-37 Emergency Switchgear and Battery Rooms Ventilation System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.3.2.1 Materials, Environment, 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 Control Rod Drive

Materials

Control rod drive system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Control rod drive system components are exposed to the following environments.

- air – indoor
- gas
- steam
- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the control rod drive 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 control rod drive system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR

3.3.2.1.2 Standby Liquid Control

Materials

Standby liquid control system components are constructed of the following materials.

- carbon steel
- nickel alloy
- stainless steel

Environment

Standby liquid control system components are exposed to the following environments.

- air – indoor
- concrete
- sodium pentaborate solution

Aging Effects Requiring Management

The following aging effects associated with the standby liquid control system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for standby liquid control system components.

- Bolting Integrity
- One-Time Inspection
- Water Chemistry Control – BWR

3.3.2.1.3 Suppression Pool Makeup

Materials

Suppression pool makeup system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Suppression pool makeup system are exposed to the following environments.

- air – indoor
- concrete
- treated water

Aging Effects Requiring Management

The following aging effects associated with the suppression pool makeup system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the suppression pool makeup system components.

- Bolting Integrity
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR

3.3.2.1.4 Leakage Detection and Control

Materials

Leakage detection and control system components are constructed of the following materials.

- carbon steel
- glass
- stainless steel

Environment

Leakage detection and control system components are exposed to the following environments.

- air – indoor
- condensation
- steam
- treated water
- treated water > 140°F
- waste water

Aging Effects Requiring Management

The following aging effects associated with the leakage detection and control 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 leakage detection and control system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Water Chemistry Control – BWR

3.3.2.1.5 Combustible Gas Control

Materials

Combustible gas control system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc (inhibited)
- copper alloy > 15% zinc or > 8% aluminum
- gray cast iron

- nickel alloy
- stainless steel

Environment

Combustible gas control system components are exposed to the following environments.

- air – indoor
- condensation
- gas
- lube oil
- raw water

Aging Effects Requiring Management

The following aging effects associated with the combustible gas control system require management.

- cracking
- cracking – fatigue
- fouling
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the combustible gas control system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Selective Leaching
- Service Water Integrity

3.3.2.1.6 <u>Fuel Pool Cooling and Cleanup</u>

Materials

Fuel pool cooling and cleanup system components are constructed of the following materials.

- boron carbide / elastomer

- carbon steel
- stainless steel

Environment

Fuel pool cooling and cleanup system components are exposed to the following environments.

- air – indoor
- treated water

Aging Effects Requiring Management

The following aging effects associated with the fuel pool cooling and cleanup system require management.

- change in material properties
- fouling
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the fuel pool cooling and cleanup system components.

- Bolting Integrity
- Boraflex Monitoring
- External Surfaces Monitoring
- One-Time Inspection
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.7 Standby Service Water

Materials

Standby service water system components are constructed of the following materials.

- carbon steel
- copper alloy
- stainless steel

Environment

Standby service water system components are exposed to the following environments.

- air – indoor
- air – outdoor
- condensation
- lube oil
- raw water
- soil

Aging Effects Requiring Management

The following aging effects associated with the standby service water system require management.

- fouling
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the standby service water system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- External Surfaces Monitoring
- Oil Analysis
- One-Time Inspection
- Service Water Integrity

3.3.2.1.8 Component Cooling Water

Materials

Component cooling water system components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Component cooling water system components are exposed to the following environments.

- air – indoor
- treated water

Aging Effects Requiring Management

The following aging effects associated with the component 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 component cooling water system components.

- Bolting Integrity
- External Surfaces Monitoring
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.9 Plant Service Water

Materials

Plant service water system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- gray cast iron
- stainless steel

Environment

Plant service water system components are exposed to the following environments.

- condensation
- gas
- raw water
- treated water

Aging Effects Requiring Management

The following aging effects associated with the plant service water system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the plant service water system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.10 Floor and Equipment Drains

Materials

Floor and equipment drains components are constructed of the following materials.

- carbon steel
- stainless steel

Environment

Floor and equipment drains components are exposed to the following environments.

- air – indoor
- concrete
- waste water

Aging Effects Requiring Management

The following aging effects associated with the floor and equipment drains require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the floor and equipment drains components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Periodic Surveillance and Preventive Maintenance

3.3.2.1.11 Compressed Air

Materials

Compressed air system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- glass
- gray cast iron
- stainless steel

Environment

Compressed air system components are exposed to the following environments.

- air – indoor
- condensation

Aging Effects Requiring Management

The following aging effects associated with the compressed air system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the compressed air system components.

- Bolting Integrity
- Compressed Air Monitoring
- External Surfaces Monitoring

3.3.2.1.12 Fire Protection – Water

Materials

Fire protection – water system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- gray cast iron

Environment

Fire protection – water system components are exposed to the following environments.

- air – indoor
- air – outdoor
- concrete
- condensation
- exhaust gas
- fuel oil
- raw water
- soil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the fire protection – water system require management.

- cracking – fatigue
- fouling
- loss of material
- loss of preload

Aging Effects Requiring Management

The following aging effects associated with the fire protection – water system require management.

- Aboveground Metallic Tanks
- Bolting Integrity
- Buried Piping and Tanks Inspection
- Diesel Fuel Monitoring
- External Surfaces Monitoring

- Fire Water System
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Selective Leaching
- Water Chemistry Control – BWR
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.13 Fire Protection – Halon and CO_2

Materials

Fire protection – Halon and CO_2 system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- stainless steel

Environment

Fire protection – Halon and CO_2 system components are exposed to the following environments.

- air – indoor
- air – outdoor
- gas
- soil

Aging Effects Requiring Management

The following aging effects associated with the fire protection – Halon and CO_2 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 – Halon and CO_2 system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection

- Fire Protection
- Internal Surfaces in Miscellaneous Piping and Ducting Components

3.3.2.1.14 Plant Chilled Water

Materials

Plant chilled water system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- glass
- gray cast iron
- stainless steel

Environment

Plant chilled water system components are exposed to the following environments.

- air – indoor
- condensation
- gas
- treated water

Aging Effects Requiring Management

The following aging effects associated with the plant chilled water system require management.

- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the plant chilled water system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Selective Leaching
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.15 Standby Diesel Generator

Materials

Standby diesel generator system components are constructed of the following materials.

- aluminum
- carbon steel
- CASS
- copper alloy
- copper alloy > 15% zinc (inhibited)
- copper alloy > 15% zinc or > 8% aluminum
- gray cast iron
- nickel alloy
- stainless steel

Environment

Standby diesel generator system components are exposed to the following environments.

- air – indoor
- air – outdoor
- concrete
- condensation
- exhaust gas
- fuel oil
- lube oil
- raw water
- soil
- treated water
- treated water > 140°F

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
- Buried Piping and Tanks Inspection
- Compressed Air Monitoring
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.16 HPCS Diesel Generator

Materials

HPCS diesel generator system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc (inhibited)
- copper alloy > 15% zinc or > 8% aluminum
- glass
- gray cast iron
- stainless steel

Environment

HPCS diesel generator system components are exposed to the following environments.

- air – indoor
- air – outdoor
- condensation
- exhaust gas
- fuel oil
- lube oil
- raw water
- soil

- treated water
- treated water > 140°F

Aging Effects Requiring Management

The following aging effects associated with the HPCS 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 HPCS diesel generator system components.

- Bolting Integrity
- Buried Piping and Tanks Inspection
- Compressed Air Monitoring
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Oil Analysis
- One-Time Inspection
- Selective Leaching
- Service Water Integrity
- Water Chemistry Control – Closed Treated Water Systems

3.3.2.1.17 Control Room Ventilation

Materials

Control room ventilation system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- elastomer
- glass
- gray cast iron
- stainless steel

Environment

Control room ventilation 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 control room ventilation system require management.

- change in material properties
- cracking
- fouling
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the control room ventilation system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Service Water Integrity

3.3.2.1.18 Heating, Ventilation and Air Conditioning

Materials

Heating, ventilation and air conditioning system components are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- elastomer
- stainless steel

Environment

Heating, ventilation and air conditioning system components are exposed to the following environments.

- air – indoor
- air – outdoor
- condensation
- raw water

Aging Effects Requiring Management

The following aging effects associated with the heating, ventilation and air conditioning systems require management.

- change in material properties
- cracking
- fouling
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the heating, ventilation and air conditioning system components.

- Bolting Integrity
- External Surfaces Monitoring
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- Service Water Integrity

3.3.2.1.19 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 3.3.2-19-xx tables.

Materials

Nonsafety-related components affecting safety-related systems are constructed of the following materials.

- aluminum
- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- elastomer

- glass
- gray cast iron
- stainless steel
- teflon

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air – indoor
- condensation
- fuel oil
- gas
- raw water
- 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 preload

Aging Management Programs

The following aging management programs manage the effects of aging on nonsafety-related components affecting safety-related systems.

- Bolting Integrity
- Compressed Air Monitoring
- Diesel Fuel Monitoring
- External Surfaces Monitoring
- Fire Water System
- Flow-Accelerated Corrosion
- Internal Surfaces in Miscellaneous Piping and Ducting Components
- One-Time Inspection
- Periodic Surveillance and Preventive Maintenance
- Selective Leaching
- Service Water Integrity

- Water Chemistry Control – BWR
- 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 GGNS 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 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). Evaluation of this TLAA is addressed in Section 4.3.

3.3.2.2.2 Cracking due to Stress Corrosion Cracking and Cyclic Loading

This paragraph in NUREG-1800 pertains to PWR non-regenerative heat exchanger components and is therefore not applicable to GGNS.

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. At GGNS, there are no stainless steel auxiliary systems components in the scope of license renewal that are exposed to outdoor air or located near unducted air intakes. Therefore, this item was not used.

3.3.2.2.4 Loss of Material due to Cladding Breach

This paragraph in NUREG-1800 pertains to PWR steel charging pump casings with stainless steel cladding exposed to treated borated water, and is therefore not applicable to GGNS which is a BWR and has no components exposed to treated borated water.

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. At GGNS, there are no stainless steel auxiliary systems components in the scope of license renewal that are exposed to outdoor air or located near unducted air intakes. Therefore, this item was not used.

3.3.2.2.6 Quality Assurance for Aging Management of Nonsafety-Related Components

See Appendix B Section B.0.3 for discussion of GGNS 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	This line item was not used. Steel cranes are evaluated as structural components in Section 3.5.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-2	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	PWR only				
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	This item was not used. There are no stainless steel auxiliary systems components exposed to outdoor air in the scope of license renewal. See Section 3.3.2.2.3.
3.3.1-5	PWR only				
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	This item was not used. There are no stainless steel auxiliary systems components exposed to outdoor air in the scope of license renewal. 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	PWR only				
3.3.1-8	PWR only				
3.3.1-9	PWR only				
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	This item was not used. There is no high-strength steel closure bolting used in auxiliary systems within the scope of license renewal.
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	This item was not used. 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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	This item was not used. As stated in Item 3.3.1-12, loss of material of steel bolting exposed to air in the auxiliary systems is managed by the Bolting Integrity Program. However, steam or water leakage is not considered as a separate aspect of the indoor air environment.
3.3.1-14	Steel, stainless steel bolting exposed to soil	Loss of preload	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload for steel bolting exposed to soil is managed by the Bolting Integrity Program. There is no stainless steel bolting exposed to soil in the auxiliary systems in scope for license renewal.
3.3.1-15	Steel; stainless steel, copper alloy, nickel alloy, stainless steel closure bolting, bolting exposed to air – indoor, uncontrolled (external), any environment, air – outdoor (external), raw water, treated borated water, fuel oil, treated water	Loss of preload due to thermal effects, gasket creep, and self-loosening	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of preload for steel and stainless steel bolting 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.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-16	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking, intergranular stress corrosion cracking	Chapter XI.M2, "Water Chemistry," and Chapter XI.M25, "BWR Reactor Water Cleanup System"	No	This item was not used. Reactor water cleanup system piping downstream of the second containment isolation valve, 4" NPS or greater, is carbon steel, and is not subject to NRC Generic Letter (GL) 88-01 requirements.
3.3.1-17	Stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Fouling of stainless steel heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage fouling.
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	This item was not used. The operating temperature of the standby liquid 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	This item was not used. Regenerative heat exchanger components with an intended function for license renewal are made of carbon steel.
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 water > 60°C (> 140°F) is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage cracking.
3.3.1-21	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 – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-22	Copper alloy piping, piping components, and piping elements 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 copper alloy components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.
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	This item was not used. Loss of material for aluminum components exposed to treated water is addressed in Item 3.3.1-25.
3.3.1-24	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	This item was not used. Loss of material for aluminum components exposed to treated water is addressed in Item 3.3.1-25.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-25	Stainless steel, steel with stainless steel cladding, aluminum piping, piping components, and piping elements, heat exchanger components exposed to treated water, sodium pentaborate solution	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 and aluminum components exposed to treated water or sodium pentaborate is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections to manage loss of material for stainless steel components of the control rod drive hydraulic system.
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	This item was not used. Elastomer linings are not credited for protection of piping in scope for license renewal.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-27	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	This item was not used. Fouling of stainless steel heat exchanger tubes exposed to treated water is addressed in Item 3.3.1-17.
3.3.1-28	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, piping, piping components, and piping elements; tanks exposed treated water >60°C (>140°F), treated borated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M2, "Water Chemistry"	No	This item was not used. The spent fuel pool is maintained at a temperature 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
3.3.1-29	Steel (with stainless steel cladding); stainless steel piping, piping components, and piping elements exposed to treated borated water	Loss of material due to pitting and crevice corrosion	Chapter XI.M2, “Water Chemistry”	No	This item was not used. Borated water is not used for reactivity control in the fuel storage and handling facilities.
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	This item was not used. There are no concrete components exposed to raw water in the auxiliary systems in the scope of license renewal.
3.3.1-30.5	Fiberglass, [high density polyethylene] HDPE piping, piping components, and piping elements exposed to raw water (internal)	Cracking, blistering, change in color due to water absorption	Chapter XI.M20, “Open-Cycle Cooling Water System”	No	This item was not used. 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	This item was not used. 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
3.3.1-32	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	This item was not used. 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 and change in material properties in elastomer components of the circulating water system (Table 3.4.2-2-18) is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. There are no elastomer components exposed to raw water in the auxiliary systems in the scope of license renewal.
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	This item was not used. 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
3.3.1-34	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	This item was not used. There are no nickel alloy components exposed to raw water in the auxiliary systems in the scope of license renewal. Copper alloy piping components exposed to raw water are addressed in Items 3.3.1-35 and 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	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to raw water is managed by the Service Water Integrity Program.
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. Loss of material for copper alloy 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
3.3.1-37	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.
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	This item was not used. Stainless steel piping components exposed to raw water are addressed in Items 3.3.1-40 and 3.3.1-41.
3.3.1-40	Stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting and crevice corrosion; fouling that leads to corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to raw water is managed by the Service Water Integrity Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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 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 or stainless steel 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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-44	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed-cycle cooling water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M21A, "Closed Treated Water Systems"	No	This item was not used. There are no stainless steel heat exchanger components exposed to closed-cycle cooling water > 60°C (> 140°F) in the auxiliary systems in the scope of license renewal.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-47	Stainless steel; steel with stainless steel cladding heat exchanger components exposed to closed-cycle cooling water	Loss of material due to microbiologically influenced corrosion	Chapter XI.M21A, "Closed Treated Water Systems"	No	Consistent with NUREG-1801. Loss of material for stainless steel heat exchanger components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
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	This item was not used. There are no aluminum components exposed to closed-cycle cooling water in the auxiliary systems in the scope of license renewal.
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 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. There are no steel heat exchanger tubes exposed to closed-cycle cooling water in the scope of license renewal.
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	Consistent with NUREG-1801. The change in material properties of the Boraflex spent fuel storage rack neutron-absorbing sheets exposed to treated water will be managed by the Boraflex Monitoring Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-52	Steel cranes: rails and structural girders exposed to air – indoor, uncontrolled (external)	Loss of material due to general corrosion	Chapter XI.M23, "Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems"	No	Consistent with NUREG-1801. Loss of material for steel crane rails and structural girders exposed to indoor air is managed by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems (Inspection of OVHLL) Program. This item applies to aging management review results presented in Tables 3.5.2-X.

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	This item was not used. Loss of material due to wear is the result of relative movement between two surfaces in contact with each other. General wear of crane rails may occur during the performance of the active function; as a result of improper design, application, or operation; or to a very small degree with insignificant consequences. Additionally, wear of crane rails due to rolling or sliding wheels is not expected in any measurable amount owing to infrequent crane use. Therefore, loss of material due to wear is not an aging effect requiring management for crane rails exposed to air-indoor, uncontrolled. However, the condition of steel crane rails is monitored by the Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program under Item 3.3.1-52.
3.3.1-54	Copper alloy piping, piping components, and piping elements exposed to condensation	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring"	No	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to condensation is managed by the Compressed Air Monitoring Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-55	Steel piping, piping components, and piping elements: compressed air system exposed to condensation (internal)	Loss of material due to general and pitting corrosion	Chapter XI.M24, “Compressed Air Monitoring"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to condensation is managed by the Compressed Air Monitoring Program.
3.3.1-56	Stainless steel piping, piping components, and piping elements exposed to condensation (internal)	Loss of material due to pitting and crevice corrosion	Chapter XI.M24, “Compressed Air Monitoring"	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to condensation is managed by the Compressed Air Monitoring Program.
3.3.1-57	Elastomers fire barrier penetration seals exposed to air - indoor, uncontrolled, air – outdoor	Increased hardness; shrinkage; loss of strength due to weathering	Chapter XI.M26, "Fire Protection"	No	Consistent with NUREG-1801. 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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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.
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	This item was not used. Although the condition of fire doors is monitored by the Fire Protection Program, wear of steel fire doors is considered an event driven condition rather than an aging effect. If the door is properly designed, installed and maintained, contact with other surfaces leading to wear will not occur.
3.3.1-60	Reinforced concrete structural fire barriers: walls, ceilings and floors exposed to air - indoor, uncontrolled	Concrete cracking and spalling due to aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, "Fire Protection," and Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. Cracking of concrete fire barriers exposed to indoor air is managed by the Fire Protection and Structures Monitoring Programs. This item applies to aging management review results presented in Tables 3.5.2-X

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-61	Reinforced concrete structural fire barriers: walls, ceilings and floors exposed to air – outdoor	Cracking, loss of material due to freeze-thaw, aggressive chemical attack, and reaction with aggregates	Chapter XI.M26, "Fire Protection," and Chapter XI.S6, "Structures Monitoring"	No	Consistent with NUREG-1801. Cracking of concrete fire barriers exposed to outdoor air is managed by the Fire Protection and Structures Monitoring Programs. This item applies to aging management review results presented in Tables 3.5.2-X
3.3.1-62	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	This item was not used. The concrete structural fire barriers are designed and constructed in accordance with ACI and American Society for Testing and Material (ASTM) standards, which provide a good-quality, relatively high-strength, dense, low-permeability concrete. The concrete provides cover over the embedded steel which is sufficient to preclude embedded steel corrosion for these barriers. See Section 3.5.2.2 for further discussion of concrete.
3.3.1-63	Steel fire hydrants exposed to air – outdoor	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M27, "Fire Water System"	No	Consistent with NUREG-1801. Loss of material for steel fire hydrants exposed to outdoor air is managed by the Fire Water System Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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.
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	This item was not used. 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	This item was not used. There are no stainless steel Fire Protection system components exposed to raw water in the scope of license renewal.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-68	Steel piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.
3.3.1-69	Copper alloy piping, piping components, and piping elements exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.
3.3.1-70	Steel piping, piping components, and piping elements; tanks exposed to fuel oil	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion; fouling that leads to corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for steel components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-71	Stainless steel, aluminum piping, piping components, and piping elements exposed to fuel oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M30, "Fuel Oil Chemistry", and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801. Loss of material for stainless steel and aluminum components exposed to fuel oil is managed by the Diesel Fuel Monitoring Program. The One-Time Inspection Program will verify the effectiveness of the Diesel Fuel Monitoring Program to manage loss of material.
3.3.1-72	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	This item was not used. 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
3.3.1-74	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	This item was not used. There are no concrete piping components in the auxiliary systems in the scope of license renewal.
3.3.1-75	Reinforced concrete, asbestos cement piping, piping components, and piping elements exposed to air – outdoor	Cracking due to aggressive chemical attack and leaching; Changes in material properties due to aggressive chemical attack	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	This item was not used. There are no concrete piping components 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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-77	Concrete; cementitious material piping, piping components, and piping elements exposed to air – outdoor	Loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	This item was not used. There are no concrete piping components in the auxiliary systems in the scope of license renewal.
3.3.1-78	Steel piping and components (external surfaces), ducting and components (external surfaces), ducting; closure bolting exposed to air – indoor, uncontrolled (external), air – indoor, uncontrolled (external), air – outdoor (external), condensation (external)	Loss of material due to general corrosion	Chapter XI.M36, "External Surfaces Monitoring of Mechanical Components"	No	Loss of material for most steel components exposed to indoor air, outdoor air or condensation is managed by the External Surfaces Monitoring Program. The Fire Protection Program manages loss of material for steel components of the Halon and CO_2 fire suppression systems exposed to outdoor air. The Service Water Integrity Program manages loss of material for steel components of the standby service water system exposed to outdoor air that are not routinely accessible for inspection under the External Surfaces Monitoring Program.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.3.1-79	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.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Loss of material for most copper alloy and aluminum components exposed to outdoor air is managed by the External Surfaces Monitoring Program. The Fire Protection Program manages loss of material for copper alloy components of the Halon and CO_2 fire suppression systems exposed to outdoor air. The Service Water Integrity Program manages loss of material for copper alloy components of the standby service water system exposed to outdoor air that are not routinely accessible for inspection under the External Surfaces Monitoring Program. The internal surfaces of aluminum flame arrestors are exposed to the same environment as the external surfaces, so the external surface conditions will be representative of internal surfaces. Thus, loss of material for internal aluminum flame arrestor surfaces is also 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
3.3.1-82	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	This item was not used. Wear of elastomer components is considered an event driven condition rather than an aging effect. If the elastomer component is properly designed, installed and maintained, contact with other surfaces leading to wear will not occur.
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	Consistent with NUREG-1801. Cracking of stainless steel diesel engine exhaust components is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components 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.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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 in the auxiliary systems in the scope of license renewal.
3.3.1-87	[There is no 3.3.1-87 in NUREG-1800.]				
3.3.1-88	Steel; stainless steel piping, piping components, and piping elements, piping, piping components, and piping elements, diesel engine exhaust exposed to raw water (potable), diesel exhaust	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Consistent with NUREG-1801. Loss of material for steel and stainless steel components exposed to raw water (potable) or diesel exhaust is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-89	Steel, copper alloy piping, piping components, and piping elements exposed to moist air or condensation (internal)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Loss of material for most steel and copper alloy components exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The Fire Water System Program manages loss of material for steel components of the fire protection system.
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	Loss of material for most steel ducting and components exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The Fire Water System Program manages loss of material for steel components of the fire protection system.

Table 3.3.1: Auxiliary Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.3.1-91	Steel piping, piping components, and piping elements; tanks exposed to waste water	Loss of material due to general, pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components"	No	Loss of material for most steel components exposed to waste water 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 nondestructive examination (NDE) techniques to manage loss of material for steel components of the floor and equipment drains system.
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	Consistent with NUREG-1801. Loss of material for aluminum components exposed to condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program.
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.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	This item was not used. There is no stainless steel ducting exposed to internal condensation in the auxiliary systems in scope for license renewal.
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	Loss of material for most copper alloy, stainless steel and steel components exposed to waste water or condensation is managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components Program. The Periodic Surveillance and Preventive Maintenance Program uses periodic visual inspections or other NDE techniques to manage loss of material for stainless steel components of the floor and equipment drains system exposed to waste water.
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	This item was not used. Wear of elastomer components is considered an event driven condition rather than an aging effect. If the elastomer component is properly designed, installed and maintained, contact with other surfaces leading to wear will not occur.

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	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 Program uses periodic visual inspections to manage loss of material for some steel diesel generator 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. 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.
3.3.1-101	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	This item was not used. 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	This item was not used. The neutron-absorbing sheets used at GGNS are Boraflex.
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	This item was not used. 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	This item was not used. 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	This item was not used. 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 Piping and Tanks Inspection Program. NUREG-1801 does not include concrete as an environment for this item.
3.3.1-107	Stainless steel 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	This item was not used. There are no stainless steel components exposed to soil in the auxiliary systems in the scope of license renewal. NUREG-1801 does not include concrete as an environment for this item.

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 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	This item was not used. 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 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 and 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	This item was not used. There are no underground aluminum, copper alloy, stainless steel or steel 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	Stainless steel piping, piping components, and piping elements exposed to treated water >60°C (>140°F)	Cracking due to stress corrosion cracking	Chapter XI.M7, "BWR Stress Corrosion Cracking," and Chapter XI.M2, "Water Chemistry"	No	This item was not used. Stainless steel components of the auxiliary systems subject to evaluation under the BWR Stress Corrosion Cracking Program, were reviewed as part of the Class 1 reactor coolant pressure boundary.
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	This item was not used. 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 and those of ACI 349 for safety-related concrete structures. Operating experience indicates no aging related degradation of this concrete.

Table 3.3.1: Auxiliary Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. There are no aluminum components exposed to other environments represented by this item, in systems in the scope of license renewal.
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.
3.3.1-115	PWR only				
3.3.1-116	Galvanized steel piping, piping components, and piping elements exposed to air - indoor, uncontrolled	None	None	NA – No AEM or AMP	This item was not used. 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 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, [polyvinyl chloride] PVC, glass piping, piping components, and piping elements exposed to air with borated water leakage, air – indoor, uncontrolled, condensation (internal), waste water	None	None	NA – No AEM or AMP	Consistent with NUREG-1801 for glass components exposed to waste water. Other material environment combinations 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, concrete 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	This item was not used. 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	This item was not used. There are no titanium components included in systems in the scope of license renewal.

Notes for Table 3.3.2-1 through Table 3.3.2-19-37

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

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 – BWR 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 Programs.

304. Linings are not credited to prevent aging effects.

305. For the purposes of evaluating Selective Leaching, this environment can be considered equivalent to the NUREG-1801 environment.

306. Changes of material properties and cracking in elastomers are results of exposure to ultra-violet light or elevated temperatures (> 95°F). The interior surfaces of these components are not exposed to ultra-violet light and are part of the control room HVAC system that is not exposed to elevated temperatures.

307. This treated water is equivalent to the NUREG-1801 raw water (potable) environment.

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.

Table 3.3.2-1
Control Rod Drive System
Summary of Aging Management Evaluation

Table 3.3.2-1: Control Rod Drive System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Accumulator	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	C
Accumulator	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VII.E3.AP-112	3.3.1-20	C, 301
Accumulator	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
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	Filtration	Stainless steel	Treated water > 140ºF (ext)	Cracking	Water Chemistry Control – BWR	VII.E3.AP-112	3.3.1-20	C, 301
Filter	Filtration	Stainless steel	Treated water > 140ºF (ext)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-1: Control Rod Drive System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Filter	Filtration	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Filter	Filtration	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Filter housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.3.2-1: Control Rod Drive 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 > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Rupture disc	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301

Table 3.3.2-1: Control Rod Drive 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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	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	Gas (int)	None	None	VII.J.AP-22	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301

Table 3.3.2-2
Standby Liquid Control System
Summary of Aging Management Evaluation

Table 3.3.2-2: Standby Liquid Control System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Accumulator	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
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	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Expansion joint	Pressure boundary	Nickel alloy	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	--	--	G
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-2: Standby Liquid Control 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	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
Heater housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Heater housing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
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	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-2: Standby Liquid Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VII.J.AP-19	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	C, 301
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-2: Standby Liquid 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	Stainless steel	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	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	Sodium pentaborate solution (int)	Loss of material	Water Chemistry Control – BWR	VII.E2.AP-141	3.3.1-25	A, 301

Table 3.3.2-3
Suppression Pool Makeup System
Summary of Aging Management Evaluation

Table 3.3.2-3: Suppression Pool 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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-3: Suppression Pool Makeup 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	Concrete (ext)	None	None	VII.J.AP-19	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Vortex breaker	Flow control	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301
Vortex breaker	Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301

Table 3.3.2-4
Leakage Detection and Control System
Summary of Aging Management Evaluation

Table 3.3.2-4: Leakage Detection and Control System								
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.A-08	3.3.1-90	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-123	3.3.1-120	A
Expansion joint	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.EP-61	3.2.1-48	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 3.3.2-4: Leakage Detection and 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	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Flow gauge	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flow gauge	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Flow gauge	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Flow gauge	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-51	3.3.1-117	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	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-4: Leakage Detection and 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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.EP-61	3.2.1-48	C
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Piping	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 301
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.EP-61	3.2.1-48	C

Table 3.3.2-4: Leakage Detection and 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	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301

Table 3.3.2-4: Leakage Detection and 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	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.EP-61	3.2.1-48	C
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Valve body	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301

Table 3.3.2-5
Combustible Gas Control System
Summary of Aging Management Evaluation

Table 3.3.2-5: Combustible Gas Control 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
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Compressor inlet shroud	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	C
Compressor inlet shroud	Pressure boundary	Aluminum	Air – indoor (int)	None	None	VII.J.AP-135	3.3.1-113	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
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302

Table 3.3.2-5: Combustible Gas 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	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	C
Heat exchanger (bonnet)	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-5: Combustible Gas 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	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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (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
Heat exchanger (tube sheets)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (tube sheets)	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 sheets)	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 sheets)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C

Table 3.3.2-5: Combustible Gas 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)	Heat transfer	Copper alloy	Condensation (int)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
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)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	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)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-133	3.3.1-99	C, 302

Table 3.3.2-5: Combustible Gas 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 > 15% zinc (inhibited)	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	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.D2.E-29	3.2.1-44	C
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	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	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
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 3.3.2-5: Combustible Gas Control System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Recombiner housing	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Recombiner housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer	Filtration	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer	Filtration	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	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	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A
Tubing	Pressure boundary	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-133	3.3.1-99	C, 302
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
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)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.3.2-5: Combustible Gas 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	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
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.H2.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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
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	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	Copper alloy	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-5: Combustible Gas 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	Copper alloy	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-133	3.3.1-99	C, 302
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.H2.AP-133	3.3.1-99	C, 302
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

Table 3.3.2-6
Fuel Pool Cooling and Cleanup System
Summary of Aging Management Evaluation

Table 3.3.2-6: Fuel Pool Cooling and Cleanup 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
Diffuser	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301
Diffuser	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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

Table 3.3.2-6: Fuel Pool Cooling and Cleanup System

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	Water Chemistry Control – Closed Treated Water Systems	VII.A4.AP-189	3.3.1-46	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Heat exchanger (tube sheets)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.E3.AP-191	3.3.1-47	C
Heat exchanger (tube sheets)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-111	3.3.1-25	A, 301
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (ext)	Fouling	Water Chemistry Control – BWR	VII.A4.AP-139	3.3.1-17	A, 301
Heat exchanger (tubes)	Heat transfer	Stainless steel	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-188	3.3.1-50	C

Table 3.3.2-6: Fuel Pool Cooling and Cleanup 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 – BWR	VII.A4.AP-111	3.3.1-25	A, 301
Heat exchanger (tubes)	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.E3.AP-191	3.3.1-47	C
Neutron absorber	Neutron absorption	Boron carbide / elastomer	Treated water (ext)	Change in material properties	Boraflex Monitoring	VII.A2.A-87	3.3.1-51	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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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 3.3.2-6: Fuel Pool Cooling and Cleanup 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	C
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 301
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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301

Table 3.3.2-6: Fuel Pool Cooling and Cleanup System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301

Table 3.3.2-7
Standby Service Water System
Summary of Aging Management Evaluation

Table 3.3.2-7: Standby Service 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 – 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	C
Bolting	Pressure boundary	Carbon steel	Condensation (ext)	Loss of preload	Bolting Integrity	--	--	H
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	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
Bolting	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Bolting Integrity	--	--	H

Table 3.3.2-7: Standby Service 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	Stainless steel	Raw water (ext)	Loss of preload	Bolting Integrity	VII.I.AP-264	3.3.1-15	A
Detector housing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Detector housing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Flexible connection	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flexible 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	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
Heat exchanger (tubes)	Heat transfer	Copper alloy	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	A
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

Table 3.3.2-7: Standby Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	A
Nozzle	Flow control	Copper alloy	Air – outdoor (ext)	Loss of material	Service Water Integrity	VII.I.AP-159	3.3.1-81	E
Nozzle	Flow control	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-196	3.3.1-36	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	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Orifice	Pressure boundary Flow control	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Orifice	Pressure boundary Flow control	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A

Table 3.3.2-7: Standby Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Service Water Integrity	VII.I.A-78	3.3.1-78	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 (ext)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.C1.AP-198	3.3.1-106	A
Piping	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Piping	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
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	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Pump casing	Pressure boundary	Stainless steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-7: Standby Service Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Pump casing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	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
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A

Table 3.3.2-7: Standby Service 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	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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
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 3.3.2-8
Component Cooling Water System
Summary of Aging Management Evaluation**

Table 3.3.2-8: Component Cooling 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	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-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-8: Component Cooling 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	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	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 3.3.2-9
Plant Service Water System
Summary of Aging Management Evaluation

Table 3.3.2-9: Plant Service 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	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
Coil	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
Coil	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-196	3.3.1-36	A
Coil	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.EP-61	3.2.1-48	C, 308
Coil	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A

Table 3.3.2-9: Plant Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flexible connection	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Flexible 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	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
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	A
Heat exchanger (shell)	Pressure boundary	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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
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

Table 3.3.2-9: Plant Service Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Raw water (ext)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	A
Heat exchanger (tube sheets)	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)	Pressure boundary	Copper alloy	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	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	A
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)	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.E3.AP-191	3.3.1-47	C

Table 3.3.2-9: Plant Service 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	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, 304
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	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Pump casing	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	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
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-9: Plant Service 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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
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	Selective Leaching	VII.C1.A-47	3.3.1-72	A
Valve body	Pressure boundary	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
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
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 3.3.2-10
Floor and Equipment Drainage
Summary of Aging Management Evaluation

Table 3.3.2-10: Floor and Equipment Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – 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	Waste water (ext)	Loss of material	Bolting Integrity	--	--	G
Bolting	Pressure boundary	Carbon steel	Waste water (ext)	Loss of preload	Bolting Integrity	--	--	G
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Waste water (ext)	Loss of material	Bolting Integrity	--	--	G
Bolting	Pressure boundary	Stainless steel	Waste water (ext)	Loss of preload	Bolting Integrity	--	--	G
Drain housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Drain housing	Pressure boundary	Carbon steel	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	A

Table 3.3.2-10: Floor and Equipment Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Drain 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	A
Drain 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
Drain housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Drain housing	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VII.J.AP-19	3.3.1-120	C
Drain 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
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	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	A
Piping	Pressure boundary	Carbon steel	Waste water (ext)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E

Table 3.3.2-10: Floor and Equipment Drains								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Piping	Pressure boundary	Carbon steel	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	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-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Concrete (ext)	None	None	VII.J.AP-19	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	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

Table 3.3.2-10: Floor and Equipment Drains

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	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	Carbon steel	Waste water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.E5.AP-281	3.3.1-91	E
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
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 3.3.2-11
Compressed Air System
Summary of Aging Management Evaluation

Table 3.3.2-11: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Accumulator	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Air cylinder	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Air cylinder	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
Compressor housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Compressor housing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A

Table 3.3.2-11: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter	Filtration	Stainless steel	Condensation (ext)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Filter	Filtration	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	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	C
Filter housing	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Filter housing	Pressure boundary	Glass	Condensation (int)	None	None	VII.J.AP-97	3.3.1-117	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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Flow element housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-11: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flow element housing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.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	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	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	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	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	A

Table 3.3.2-11: Compressed Air 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	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	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	A
Valve body	Pressure boundary	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	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A

Table 3.3.2-11: Compressed Air System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	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

Table 3.3.2-12
Fire Protection – Water System
Summary of Aging Management Evaluation

Table 3.3.2-12: 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 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
Breather vent	Filtration	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Breather vent	Filtration	Carbon steel	Condensation (int)	Loss of material	Fire Water System	VII.G.A-23	3.3.1-89	E
Expansion joint	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-12: Fire Protection – Water 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	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	C
Flame arrestor	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
Flame arrestor	Flow control	Copper alloy > 15% Zn or > 8% Al	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Heat exchanger (bonnet)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (bonnet)	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	C
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C

Table 3.3.2-12: 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)	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	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	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
Hose station	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Hose station	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
Hose station	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-47	3.3.1-72	A

Table 3.3.2-12: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Hose station	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.E3.AP-32	3.3.1-72	C
Hose station	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-140	3.3.1-22	C, 301
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	C
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	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	A

Table 3.3.2-12: 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	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 (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
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	C
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-234	3.3.1-68	A, 303

Table 3.3.2-12: 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 (ext)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
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 Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Piping	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
Piping	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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A

Table 3.3.2-12: 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	Filtration	Copper alloy > 15% Zn or > 8% Al	Raw water (ext)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	A
Strainer	Filtration	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
Strainer	Filtration	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-47	3.3.1-72	A
Strainer	Filtration	Copper alloy > 15% Zn or > 8% Al	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-140	3.3.1-22	C, 301
Strainer	Filtration	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-32	3.3.1-72	C
Strainer	Filtration	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-140	3.3.1-22	C, 301
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
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301

Table 3.3.2-12: Fire Protection – Water System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	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	VII.F1.A-08	3.3.1-90	E
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-234	3.3.1-68	C, 303
Tank	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	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
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

Table 3.3.2-12: 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	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	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	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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.G.AP-132	3.3.1-69	A, 303
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Fire Water System	VII.G.AP-197	3.3.1-64	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	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-32	3.3.1-72	C

Table 3.3.2-12: 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-140	3.3.1-22	C, 301
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	Air – outdoor (ext)	Loss of material	Fire Water System	VII.G.AP-149	3.3.1-63	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
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-51	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
Valve body	Pressure boundary	Gray cast iron	Soil (ext)	Loss of material	Selective Leaching	VII.G.A-02	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.G.AP-31	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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 3.3.2-13
Fire Protection – Halon and CO_2 System
Summary of Aging Management Evaluation

Table 3.3.2-13: Fire Protection – Halon and CO_2 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
Coil	Pressure boundary	Copper alloy	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	A
Coil	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Nozzle	Pressure boundary Flow control	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A

Table 3.3.2-13: Fire Protection – Halon and CO_2 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	Aluminum	Air – indoor (int)	None	None	VII.J.AP-135	3.3.1-113	A
Nozzle	Pressure boundary Flow control	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	A
Nozzle	Pressure boundary Flow control	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	A

Table 3.3.2-13: Fire Protection – Halon and CO_2 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.D2.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Fire Protection	VII.I.A-78	3.3.1-78	E
Piping	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.G.AP-198	3.3.1-106	A
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
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	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
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

Table 3.3.2-13: Fire Protection – Halon and CO_2 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 – outdoor (ext)	Loss of material	Fire Protection	VII.I.AP-159	3.3.1-81	E
Tubing	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	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	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	Fire Protection	VII.G.AP-150	3.3.1-58	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	Fire Protection	VII.I.A-78	3.3.1-78	E
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

Table 3.3.2-13: Fire Protection – Halon and CO_2 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 (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	Fire Protection	VII.I.AP-159	3.3.1-81	E
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	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

Table 3.3.2-14
Plant Chilled Water System
Summary of Aging Management Evaluation

Table 3.3.2-14: Plant Chilled 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	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
Coil	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
Coil	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Flexible connection	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.3.2-14: Plant Chilled Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible 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	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.C2.AP-202	3.3.1-45	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	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	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A

Table 3.3.2-14: Plant Chilled Water System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	A
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	C
Heat exchanger (tubes)	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
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.C2.AP-199	3.3.1-46	C
Orifice	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Orifice	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 3.3.2-14: Plant Chilled 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.D2.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	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	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	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Pump casing	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-14: Plant Chilled Water 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	Gray cast iron	Condensation (ext)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A, 305
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Sight glass	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-51	3.3.1-117	A

Table 3.3.2-14: Plant Chilled Water 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	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
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	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.C2.AP-202	3.3.1-45	A
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
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

Table 3.3.2-14: Plant Chilled Water 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 (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	Selective Leaching	VII.C2.AP-32	3.3.1-72	A, 305
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	A

Table 3.3.2-14: Plant Chilled 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A, 305
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-15
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**
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	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Bolting	Pressure boundary	Carbon steel	Fuel oil (ext)	Loss of preload	Bolting Integrity	VII.I.AP-266	3.3.1-15	A
Bolting	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-127	3.3.1-97	C, 302
Bolting	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of preload	Bolting Integrity	--	--	G
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VII.I.AP-124	3.3.1-15	A
Bolting	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Bolting	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of preload	Bolting Integrity	VII.I.AP-266	3.3.1-15	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
Bolting	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.C1.AP-138	3.3.1-100	C, 302
Bolting	Pressure boundary	Stainless steel	Lube oil (ext)	Loss of preload	Bolting Integrity	--	--	G
Expansion joint	Pressure boundary	Nickel alloy	Air – indoor (ext)	None	None	VII.J.AP-16	3.3.1-118	A
Expansion joint	Pressure boundary	Nickel alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	--	--	G
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	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Expansion joint	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-128	3.3.1-83	A
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

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
Filter	Filtration	Carbon steel	Lube oil (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-127	3.3.1-97	E
Filter	Filtration	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-127	3.3.1-97	E
Filter housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Filter housing	Pressure boundary	Aluminum	Condensation (int)	Loss of material	Compressed Air Monitoring	--	--	G
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	C
Filter housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-127	3.3.1-97	E
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	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
Flame arrestor	Flow control	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	A
Flame arrestor	Flow control	Aluminum	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	A
Flame arrestor	Flow control	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	A
Flame arrestor	Flow control	Gray cast iron	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
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	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C
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 (bonnet)	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	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 (bonnet)	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	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	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	C
Heat exchanger (shell)	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	C, 302
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.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

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 (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 sheets)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	A, 302
Heat exchanger (tube sheets)	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 sheets)	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 sheets)	Pressure boundary	Copper alloy	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-133	3.3.1-99	C, 302
Heat exchanger (tube sheets)	Pressure boundary	Copper alloy	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	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 (tube sheets)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (ext)	Loss of material	Selective Leaching	VII.H2.A-47	3.3.1-72	C
Heat exchanger (tube sheets)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Raw water (ext)	Loss of material	Service Water Integrity	VII.H2.AP-193	3.3.1-35	C
Heat exchanger (tube sheets)	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	C
Heat exchanger (tube sheets)	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	Copper alloy	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G

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)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	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	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	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)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	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	Copper alloy > 15% zinc (inhibited)	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% zinc (inhibited)	Raw water (int)	Loss of material	Service Water Integrity	VII.H2.AP-193	3.3.1-35	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Loss of material – wear	Service Water Integrity	--	--	H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	C
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.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
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
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.D2.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	Concrete (ext)	None	None	VII.J.AP-282	3.3.1-112	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
Piping	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Piping	Pressure boundary	Carbon steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303

Table 3.3.2-15: 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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Piping	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1.AP-198	3.3.1-106	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
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	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	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
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Pump casing	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Pump casing	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Selective Leaching	VII.H2.AP-43	3.3.1-72	A
Pump casing	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	A
Pump casing	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Pump casing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303

Table 3.3.2-15: Standby Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Strainer	Filtration	Aluminum	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-129	3.3.1-71	A, 303
Strainer	Filtration	Aluminum	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-129	3.3.1-71	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	Filtration	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Strainer	Filtration	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	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**
Strainer	Filtration	Stainless steel	Condensation (ext)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Strainer	Filtration	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Strainer	Filtration	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Strainer	Filtration	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
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)	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Strainer housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Strainer housing	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	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**
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Tank	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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	C
Tank	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1.AP-198	3.3.1-106	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	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	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
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-132	3.3.1-69	A, 303
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-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Tubing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Tubing	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302

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	Treated water > 140ºF (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 > 140ºF (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Turbocharger	Pressure boundary	CASS	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Turbocharger	Pressure boundary	CASS	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Turbocharger	Pressure boundary	CASS	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Turbocharger	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Turbocharger	Pressure boundary	Gray cast iron	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Turbocharger	Pressure boundary	Gray cast iron	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**
Turbocharger	Pressure boundary	Gray cast iron	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Turbocharger	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	C, 302
Turbocharger	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	C
Turbocharger	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	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 – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.H1.A-24	3.3.1-80	A
Valve body	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Valve body	Pressure boundary	Carbon steel	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	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**
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (int)	None	None	VII.J.AP-144	3.3.1-114	A
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	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	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	C
Valve body	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303

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	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (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 > 140ºF (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C

Table 3.3.2-16
HPCS Diesel Generator System
Summary of Aging Management Evaluation

Table 3.3.2-16: HPCS 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	Aluminum	Air – indoor (ext)	None	None	VII.I.AP-135	3.3.1-113	A
Air start motor housing	Pressure boundary	Aluminum	Condensation (int)	Loss of material	Compressed Air Monitoring	--	--	G
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	Carbon steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Bolting	Pressure boundary	Carbon steel	Fuel oil (ext)	Loss of preload	Bolting Integrity	VII.I.AP-266	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

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Bolting	Pressure boundary	Stainless steel	Fuel oil (ext)	Loss of preload	Bolting Integrity	VII.I.AP-266	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	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Filter	Filtration	Carbon steel	Lube oil (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-127	3.3.1-97	E
Filter	Filtration	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-127	3.3.1-97	E
Filter	Filtration	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Filter	Filtration	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
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 3.3.2-16: HPCS Diesel Generator System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Filter housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-127	3.3.1-97	E
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Flame arrestor	Flow control	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	A
Flame arrestor	Flow control	Aluminum	Air – outdoor (int)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	A
Flame arrestor	Flow control	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-78	3.3.1-78	A
Flame arrestor	Flow control	Gray cast iron	Air – outdoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G
Flexible connection	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flexible connection	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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Flexible connection	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
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.H2.AP-199	3.3.1-46	C
Heat exchanger (bonnet)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C

Table 3.3.2-16: HPCS 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 (bonnet)	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	C
Heat exchanger (bonnet)	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 (fins)	Heat transfer	Aluminum	Air – indoor (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Heat exchanger (shell)	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	C
Heat exchanger (shell)	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	C, 302
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (shell)	Pressure boundary	Carbon steel	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 sheets)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Heat exchanger (tube sheets)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-131	3.3.1-98	A, 302
Heat exchanger (tube sheets)	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 sheets)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Raw water (ext)	Loss of material	Service Water Integrity	VII.H2.AP-193	3.3.1-35	C
Heat exchanger (tube sheets)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	C

Table 3.3.2-16: HPCS 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 sheets)	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	C, 302
Heat exchanger (tube sheets)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (ext)	Loss of material	Selective Leaching	VII.H2.AP-43	3.3.1-72	C
Heat exchanger (tube sheets)	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy	Treated water (int)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Lube oil (ext)	Fouling	Oil Analysis	V.D2.EP-78	3.2.1-51	C, 302
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Raw water (int)	Fouling	Service Water Integrity	VII.C1.A-72	3.3.1-42	C

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Fouling	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-205	3.3.1-50	C
Heat exchanger (tubes)	Heat transfer	Copper alloy > 15% zinc (inhibited)	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	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	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)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	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% zinc (inhibited)	Raw water (int)	Loss of material	Service Water Integrity	VII.H2.AP-193	3.3.1-35	C

Table 3.3.2-16: HPCS 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% zinc (inhibited)	Treated water (ext)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	C
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (ext)	Loss of material – wear	Service Water Integrity	--	--	H
Heat exchanger (tubes)	Pressure boundary	Copper alloy > 15% zinc (inhibited)	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-199	3.3.1-46	C
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	C
Lubricator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Lubricator	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	C, 302

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Orifice	Pressure boundary Flow control	Stainless steel	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
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.D2.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
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 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Piping	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1.AP-198	3.3.1-106	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (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	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 (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303

Table 3.3.2-16: HPCS Diesel Generator 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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
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-123	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Sight glass	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Silencer	Pressure boundary	Carbon steel	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
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	Filtration	Copper alloy > 15% Zn or > 8% Al	Lube oil (ext)	Loss of material	Oil Analysis	VII.H2.AP-133	3.3.1-99	A, 302
Strainer	Filtration	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
Strainer	Filtration	Stainless steel	Condensation (ext)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C, 308
Strainer	Filtration	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Strainer	Filtration	Stainless steel	Fuel oil (ext)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Strainer	Filtration	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303

Table 3.3.2-16: HPCS 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	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)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Strainer housing	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Strainer housing	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Strainer housing	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Strainer housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Tank	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
Tank	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303

Table 3.3.2-16: HPCS 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	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VII.H1.AP-198	3.3.1-106	C
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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Thermowell	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-138	3.3.1-100	A, 302
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-186	3.3.1-43	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (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	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

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Copper alloy	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-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Tubing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (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 > 140ºF (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Turbocharger	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-16: HPCS Diesel Generator System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Turbocharger	Pressure boundary	Gray cast iron	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Turbocharger	Pressure boundary	Gray cast iron	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Turbocharger	Pressure boundary	Gray cast iron	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.H2.AP-104	3.3.1-88	A
Turbocharger	Pressure boundary	Gray cast iron	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	C, 302
Turbocharger	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Turbocharger	Pressure boundary	Stainless steel	Exhaust gas (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H
Turbocharger	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	C
Valve body	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Valve body	Pressure boundary	Aluminum	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-162	3.3.1-99	A, 302

Table 3.3.2-16: HPCS 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	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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Valve body	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VII.H2.AP-127	3.3.1-97	A, 302
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.H2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	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	Exhaust gas (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	G

Table 3.3.2-16: HPCS 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	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	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	C
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	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
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 3.3.2-17
Control Room Heating, Ventilation, and Air Conditioning System
Summary of Aging Management Evaluation

Table 3.3.2-17: Control Room 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
Charcoal filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Charcoal filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Compressor housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Compressor housing	Pressure boundary	Gray cast iron	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Damper housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A

Table 3.3.2-17: Control Room Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Damper housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Demister housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Demister housing	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.A-08	3.3.1-90	A
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.B.E-25	3.2.1-44	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 (int)	None	None	VII.F1.AP-102	3.3.1-76	I, 306

Table 3.3.2-17: Control Room Ventilation System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Evaporator housing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Evaporator housing	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.A-08	3.3.1-90	A
Evaporator tube fins	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Evaporator tubes	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H
Evaporator tubes	Heat transfer	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	C
Evaporator 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
Evaporator tubes	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	C
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A

Table 3.3.2-17: Control Room Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Fan housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Filter dryer housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Filter dryer housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
Filter train housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Filter train housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-41	3.3.1-80	A
Heat exchanger (bonnet)	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C

Table 3.3.2-17: Control Room Ventilation 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	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 (tube sheets)	Pressure boundary	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	C
Heat exchanger (tube sheets)	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	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	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	Gas (ext)	None	None	VII.J.AP-9	3.3.1-114	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 3.3.2-17: Control Room 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.F1.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.B.E-25	3.2.1-44	C
HEPA filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
HEPA filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Humidifier housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Humidifier housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Muffler housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Muffler housing	Pressure boundary	Carbon steel	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	C
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: Control Room Ventilation 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.D2.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	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
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
Plenum housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Plenum housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Prefilter 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: Control Room Ventilation System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Prefilter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	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	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	Gas (int)	None	None	VII.J.AP-98	3.3.1-117	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	Copper alloy	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-17: Control Room Ventilation 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 (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.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.D2.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	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	Gas (int)	None	None	VII.J.AP-9	3.3.1-114	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-18
Heating, Ventilation and Air Conditioning System
Summary of Aging Management Evaluation

Table 3.3.2-18: Heating, Ventilation and Air Conditioning System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-105	3.3.1-78	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
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.B.E-25	3.2.1-44	C
Duct	Pressure boundary	Aluminum	Air – indoor (ext)	None	None	VII.J.AP-135	3.3.1-113	A
Duct	Pressure boundary	Aluminum	Air – indoor (int)	None	None	VII.J.AP-135	3.3.1-113	A
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.A-10	3.3.1-78	A

Table 3.3.2-18: Heating, Ventilation and Air Conditioning System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	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 (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
Fan housing	Pressure boundary	Aluminum	Air – indoor (int)	None	None	VII.J.AP-135	3.3.1-113	A
Fan housing	Pressure boundary	Aluminum	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.AP-256	3.3.1-81	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.B.E-25	3.2.1-44	C

Table 3.3.2-18: Heating, Ventilation and Air Conditioning System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Heat exchanger (drain pan)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A
Heat exchanger (drain pan)	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	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F2.AP-41	3.3.1-80	A
Heat exchanger (housing)	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Heat exchanger (tubes)	Heat transfer	Copper alloy	Condensation (ext)	Fouling	Internal Surfaces in Miscellaneous Piping and Ducting Components	--	--	H

Table 3.3.2-18: Heating, Ventilation and Air Conditioning System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 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	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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-179	3.3.1-38	C
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
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F2.A-08	3.3.1-90	A

Table 3.3.2-18: Heating, Ventilation and Air Conditioning System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Vol. 2 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	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
Strainer	Pressure boundary Filtration	Carbon steel	Air – indoor (ext)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C, 308
Strainer	Pressure boundary Filtration	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	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
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.B.E-25	3.2.1-44	C

Table 3.3.2-18: Heating, Ventilation and Air Conditioning System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Vol. 2 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-1
CRD Hydraulic System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-1: CRD Hydraulic System [10 CFR 54.4(a)(2)]

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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Filter housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Filter housing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.E3.AP-31	3.3.1-72	C
Filter housing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-1: CRD Hydraulic System [10 CFR 54.4(a)(2)]

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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Filter housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Filter housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Flexible connection	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Flexible connection	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-1: CRD Hydraulic System [10 CFR 54.4(a)(2)]

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	Gas (int)	None	None	VII.J.AP-6	3.3.1-121	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VII.A4.AP-110	3.3.1-25	E
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301

Table 3.3.2-19-1: CRD Hydraulic System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Pump casing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Pump casing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.E3.AP-32	3.3.1-72	C
Pump casing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-140	3.3.1-22	C, 301
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 – BWR	VII.E3.AP-106	3.3.1-21	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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-1: CRD Hydraulic System [10 CFR 54.4(a)(2)]

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 – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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 – BWR	VII.E3.AP-106	3.3.1-21	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	VII.E3.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 – BWR	VII.E3.AP-140	3.3.1-22	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-1: CRD Hydraulic System [10 CFR 54.4(a)(2)]

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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-2
Standby Liquid Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-2: Standby Liquid Control System [10 CFR 54.4(a)(2)]								
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
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301

Table 3.3.2-19-2: Standby Liquid Control System [10 CFR 54.4(a)(2)]								
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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
Sight glass	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Sight glass	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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 3.3.2-19-2: Standby Liquid Control System [10 CFR 54.4(a)(2)]								
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 – BWR	VII.E3.AP-106	3.3.1-21	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-3
Process Radiation Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-3: Process Radiation Monitoring System [10 CFR 54.4(a)(2)]

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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible 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
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

Table 3.3.2-19-3: Process Radiation Monitoring System [10 CFR 54.4(a)(2)]

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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	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-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	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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-3: Process Radiation Monitoring System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	C
Valve body	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	C

Table 3.3.2-19-4
Leak Detection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-4: Leak Detection System [10 CFR 54.4(a)(2)]

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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	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
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	C

Table 3.3.2-19-4: Leak Detection System [10 CFR 54.4(a)(2)]

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	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.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Thermowell	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-4: Leak Detection System [10 CFR 54.4(a)(2)]								
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	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
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 3.3.2-19-5
MSIV – Leakage Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-5: MSIV – Leakage Control System [10 CFR 54.4(a)(2)]

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	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	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	C

Table 3.3.2-19-5: MSIV – Leakage Control System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	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	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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C

Table 3.3.2-19-6
Combustible Gas Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-6: Combustible Gas Control System [10 CFR 54.4(a)(2)]								
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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	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
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	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.B.E-25	3.2.1-44	C

Table 3.3.2-19-6: Combustible Gas Control System [10 CFR 54.4(a)(2)]

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
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
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	C

Table 3.3.2-19-6: Combustible Gas Control System [10 CFR 54.4(a)(2)]

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
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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-6: Combustible Gas Control System [10 CFR 54.4(a)(2)]								
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	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
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	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.D2.E-29	3.2.1-44	C

Table 3.3.2-19-6: Combustible Gas Control System [10 CFR 54.4(a)(2)]

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	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	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
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C

Table 3.3.2-19-6: Combustible Gas Control System [10 CFR 54.4(a)(2)]								
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	Condensation (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	C

Table 3.3.2-19-7
Reactor Water Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-7: Reactor Water Cleanup System [10 CFR 54.4(a)(2)]

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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 301
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	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 301
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 – BWR	VII.E3.AP-106	3.3.1-21	A, 301

Table 3.3.2-19-7: Reactor Water Cleanup System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Flexible connection	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flexible connection	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 301
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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow Accelerated Corrosion	V.D2.E-09	3.2.1-11	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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 3.3.2-19-7: Reactor Water Cleanup System [10 CFR 54.4(a)(2)]

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	Flow Accelerated Corrosion	V.D2.E-09	3.2.1-11	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	A, 301
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	A, 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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow Accelerated Corrosion	V.D2.E-09	3.2.1-11	C

Table 3.3.2-19-7: Reactor Water Cleanup System [10 CFR 54.4(a)(2)]								
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 – BWR	VII.E3.AP-106	3.3.1-21	A, 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 301
Rupture disc	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Rupture disc	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 301
Rupture disc	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Rupture disc	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	A, 301
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 – BWR	VII.E3.AP-106	3.3.1-21	A, 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

Table 3.3.2-19-7: Reactor Water Cleanup System [10 CFR 54.4(a)(2)]

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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	A, 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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	A, 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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C

Table 3.3.2-19-7: Reactor Water Cleanup System [10 CFR 54.4(a)(2)]

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	V.D2.E-09	3.2.1-11	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	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	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	A, 301

Table 3.3.2-19-8
Fuel Pool Cooling and Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-8: Fuel Pool Cooling and Cleanup System [10 CFR 54.4(a)(2)]

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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Duct	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.A-08	3.3.1-90	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 3.3.2-19-8: Fuel Pool Cooling and Cleanup System [10 CFR 54.4(a)(2)]								
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301
Flexible connection	Pressure boundary	Teflon	Treated water (int)	None	None	--	--	G
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	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 3.3.2-19-8: Fuel Pool Cooling and Cleanup System [10 CFR 54.4(a)(2)]								
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 (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
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	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301

Table 3.3.2-19-8: Fuel Pool Cooling and Cleanup System [10 CFR 54.4(a)(2)]

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 – BWR	VII.E3.AP-106	3.3.1-21	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 – BWR	VII.E3.AP-106	3.3.1-21	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 – BWR	VII.E3.AP-106	3.3.1-21	C, 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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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 3.3.2-19-8: Fuel Pool Cooling and Cleanup System [10 CFR 54.4(a)(2)]								
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	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301

Table 3.3.2-19-9
CRD Maintenance Facility, Flush Tank Filter and Leak Test System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-9: CRD Maintenance Facility, Flush Tank Filter and Leak Test System [10 CFR 54.4(a)(2)]

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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-9: CRD Maintenance Facility, Flush Tank Filter and Leak Test System [10 CFR 54.4(a)(2)]								
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-123	3.3.1-120	A
Pump casing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-10
Containment Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-10: Containment Cooling System [10 CFR 54.4(a)(2)]

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.F3.A-10	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	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	Stainless 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.F3.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.B.E-25	3.2.1-44	C

Table 3.3.2-19-10: Containment Cooling System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Damper housing	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F3.A-08	3.3.1-90	A
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.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.B.E-25	3.2.1-44	C
Duct	Pressure boundary	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F3.A-08	3.3.1-90	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Change in material properties	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A

Table 3.3.2-19-10: Containment Cooling System [10 CFR 54.4(a)(2)]								
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.F3.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.B.E-25	3.2.1-44	C
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.A-10	3.3.1-78	A
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	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.D2.E-29	3.2.1-44	C

Table 3.3.2-19-10: Containment Cooling System [10 CFR 54.4(a)(2)]								
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
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 3.3.2-19-11
Drywell Cooling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-11: Drywell Cooling System [10 CFR 54.4(a)(2)]

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
Damper housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Damper housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Duct	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Duct	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Change in material properties	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (ext)	Cracking	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A

Table 3.3.2-19-11: Drywell Cooling System [10 CFR 54.4(a)(2)]

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)	Change in material properties	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Duct flexible connection	Pressure boundary	Elastomer	Air – indoor (int)	Cracking	External Surfaces Monitoring	VII.F3.AP-102	3.3.1-76	A
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.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.B.E-25	3.2.1-44	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F3.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.B.E-25	3.2.1-44	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.D2.E-29	3.2.1-44	C

Table 3.3.2-19-11: Drywell Cooling System [10 CFR 54.4(a)(2)]

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
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.D2.E-29	3.2.1-44	C

Table 3.3.2-19-12
Containment Leak Rate Test System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-12: Containment Leak Rate Test System [10 CFR 54.4(a)(2)]

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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-12: Containment Leak Rate Test System [10 CFR 54.4(a)(2)]

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.D2.E-29	3.2.1-44	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
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.D2.E-29	3.2.1-44	C
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-13
Auxiliary Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-13: Auxiliary Steam System [10 CFR 54.4(a)(2)]

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
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	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
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 3.3.2-19-13: Auxiliary Steam System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-19-14
Make Up Water Treatment System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-14: Make Up Water Treatment System [10 CFR 54.4(a)(2)]

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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Filter housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-14: Make Up Water Treatment System [10 CFR 54.4(a)(2)]								
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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Strainer housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Strainer housing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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 – BWR	VII.E3.AP-106	3.3.1-21	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

Table 3.3.2-19-14: Make Up Water Treatment System [10 CFR 54.4(a)(2)]								
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.E3.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 – BWR	VII.E3.AP-140	3.3.1-22	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-15
Process Sampling System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-15: Process Sampling System [10 CFR 54.4(a)(2)]								
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	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C
Coil	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Coil	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-25	3.4.1-26	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 3.3.2-19-15: Process Sampling System [10 CFR 54.4(a)(2)]

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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Flexible connection	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Flexible connection	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Flexible connection	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-15: Process Sampling System [10 CFR 54.4(a)(2)]

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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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	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	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.3.2-19-15: Process Sampling System [10 CFR 54.4(a)(2)]								
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 > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Pump casing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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 – BWR	VII.E3.AP-106	3.3.1-21	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	V.D2.E-10	3.2.1-1	C
Thermowell	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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 – BWR	VII.E3.AP-140	3.3.1-22	C, 301

Table 3.3.2-19-15: Process Sampling System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-130	3.3.1-25	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	C, 301

Table 3.3.2-19-15: Process Sampling System [10 CFR 54.4(a)(2)]								
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	Selective Leaching	VII.E3.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 – BWR	VII.E3.AP-140	3.3.1-22	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	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 water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-16
Standby Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-16: Standby Service Water System [10 CFR 54.4(a)(2)]

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 preload	Bolting Integrity	--	--	H
Flexible connection	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Flexible connection	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
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, 304
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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304

Table 3.3.2-19-16: Standby Service Water System [10 CFR 54.4(a)(2)]								
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 (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, 304
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	Selective Leaching	VII.C1.A-47	3.3.1-72	A
Valve body	Pressure boundary	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
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C

Table 3.3.2-19-17
Component Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-17: Component Cooling Water System [10 CFR 54.4(a)(2)]

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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible 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	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-19-17: Component Cooling Water System [10 CFR 54.4(a)(2)]

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	VII.J.AP-123	3.3.1-120	A
Orifice	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
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
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Pump casing	Pressure boundary	Gray cast iron	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

Table 3.3.2-19-17: Component Cooling Water System [10 CFR 54.4(a)(2)]								
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 – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VII.J.AP-14	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-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 – 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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-17: Component Cooling Water System [10 CFR 54.4(a)(2)]

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	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.C2.AP-199	3.3.1-46	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-19-17: Component Cooling Water System [10 CFR 54.4(a)(2)]

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	Selective Leaching	VII.C2.AP-43	3.3.1-72	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Valve body	Pressure boundary	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	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	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 3.3.2-19-18
Turbine Building Cooling Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-18: Turbine Building Cooling Water System [10 CFR 54.4(a)(2)]								
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
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Flow element	Pressure boundary	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-19-18: Turbine Building Cooling Water System [10 CFR 54.4(a)(2)]

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	VII.I.A-77	3.3.1-78	A
Heat exchanger (bonnet)	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	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	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
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-18: Turbine Building Cooling Water System [10 CFR 54.4(a)(2)]								
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
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-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

Table 3.3.2-19-18: Turbine Building Cooling Water System [10 CFR 54.4(a)(2)]								
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.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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	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
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	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	Copper alloy	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A

Table 3.3.2-19-18: Turbine Building Cooling Water System [10 CFR 54.4(a)(2)]								
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 – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	A

Table 3.3.2-19-18: Turbine Building Cooling Water System [10 CFR 54.4(a)(2)]								
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	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	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	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	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 3.3.2-19-19
Plant Service Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-19: Plant Service Water System [10 CFR 54.4(a)(2)]								
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	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Ejector	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
Ejector	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Ejector	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	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	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304

Table 3.3.2-19-19: Plant Service Water System [10 CFR 54.4(a)(2)]

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	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, 304
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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.A-54	3.3.1-40	A
Tubing	Pressure boundary	Copper alloy	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-196	3.3.1-36	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
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-19-19: Plant Service Water System [10 CFR 54.4(a)(2)]

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	Service Water Integrity	VII.C1.AP-194	3.3.1-37	A, 304
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	Selective Leaching	VII.C1.A-47	3.3.1-72	A
Valve body	Pressure boundary	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
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Service Water Integrity	VII.C1.AP-183	3.3.1-38	C

Table 3.3.2-19-20
Floor and Equipment Drainage System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-20: Floor and Equipment Drain System [10 CFR 54.4(a)(2)]

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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	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
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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-19-20: Floor and Equipment Drain System [10 CFR 54.4(a)(2)]

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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-189	3.3.1-46	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	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 3.3.2-19-20: Floor and Equipment Drain System [10 CFR 54.4(a)(2)]

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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-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
Rupture disc	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Rupture disc	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 3.3.2-19-20: Floor and Equipment Drain System [10 CFR 54.4(a)(2)]								
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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	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	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	A
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-278	3.3.1-95	A

Table 3.3.2-19-20: Floor and Equipment Drain System [10 CFR 54.4(a)(2)]

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	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	A
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-123	3.3.1-120	A

Table 3.3.2-19-20: Floor and Equipment Drain System [10 CFR 54.4(a)(2)]

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

Table 3.3.2-19-21
Compressed Air System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-21: Compressed Air System [10 CFR 54.4(a)(2)]

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	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
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.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	A

Table 3.3.2-19-21: Compressed Air System [10 CFR 54.4(a)(2)]								
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	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	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Piping	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	A
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	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	A
Tubing	Pressure boundary	Copper alloy	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-21: Compressed Air System [10 CFR 54.4(a)(2)]

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	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	Carbon steel	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	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	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.A-26	3.3.1-55	A

Table 3.3.2-19-21: Compressed Air System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Valve body	Pressure boundary	Stainless steel	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	A

Table 3.3.2-19-22
Suppression Pool Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-22: Suppression Pool Cleanup System [10 CFR 54.4(a)(2)]

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	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C

Table 3.3.2-19-22: Suppression Pool Cleanup System [10 CFR 54.4(a)(2)]

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 – BWR	VII.E3.AP-106	3.3.1-21	C, 301
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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	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)	Cracking – fatigue	TLAA – metal fatigue	V.D2.E-10	3.2.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-106	3.3.1-21	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	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 301
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	A, 301

Table 3.3.2-19-23
Fire Protection System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-23: Fire Protection System [10 CFR 54.4(a)(2)]

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	Raw water (int)	Loss of material	Fire Water System	VII.G.A-33	3.3.1-64	A
Nozzle	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Nozzle	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	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 3.3.2-19-23: Fire Protection System [10 CFR 54.4(a)(2)]								
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
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	Fire Water System	VII.G.A-33	3.3.1-64	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	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
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VII.G.A-51	3.3.1-72	A

Table 3.3.2-19-24
Domestic Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-24: Domestic Water System [10 CFR 54.4(a)(2)]								
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 307
Piping	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Piping	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, 307

Table 3.3.2-19-24: Domestic Water System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
Pump casing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 307
Pump casing	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	C, 305
Strainer housing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Air – indoor (ext)	None	None	VII.J.AP-144	3.3.1-114	A
Strainer housing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-271	3.3.1-93	C, 307
Strainer housing	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C1.A-47	3.3.1-72	C, 305
Tank	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-24: Domestic Water System [10 CFR 54.4(a)(2)]

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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 307
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, 307
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, 307
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, 307

Table 3.3.2-19-24: Domestic Water System [10 CFR 54.4(a)(2)]								
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.C1.A-47	3.3.1-72	C, 305
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	Treated water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-270	3.3.1-88	C, 307
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C1.A-51	3.3.1-72	C, 305

Table 3.3.2-19-25
Plant Chilled Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-25: Plant Chilled Water System [10 CFR 54.4(a)(2)]								
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
Flexible connection	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Flexible 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	A
Orifice	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Orifice	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 3.3.2-19-25: Plant Chilled Water System [10 CFR 54.4(a)(2)]								
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.D2.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	Treated water (int)	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	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	A
Rupture disc	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Rupture disc	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 3.3.2-19-25: Plant Chilled Water System [10 CFR 54.4(a)(2)]

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	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-51	3.3.1-117	A
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	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.C2.AP-202	3.3.1-45	A
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G

Table 3.3.2-19-25: Plant Chilled Water System [10 CFR 54.4(a)(2)]								
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	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
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	VII.C2.AP-43	3.3.1-72	A

Table 3.3.2-19-25: Plant Chilled Water System [10 CFR 54.4(a)(2)]								
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	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	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	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-19-26
Drywell Chilled Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-26: Drywell Chilled Water System [10 CFR 54.4(a)(2)]								
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	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
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	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C2.AP-259	3.3.1-85	A

Table 3.3.2-19-26: Drywell Chilled Water System [10 CFR 54.4(a)(2)]								
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	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.C2.AP-259	3.3.1-85	A
Flexible connection	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Flexible 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	A
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.C2.AP-202	3.3.1-45	A
Piping	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Pump casing	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-19-26: Drywell Chilled Water System [10 CFR 54.4(a)(2)]								
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	A
Sight glass	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Sight glass	Pressure boundary	Glass	Condensation (ext)	None	None	VII.J.AP-97	3.3.1-117	A
Sight glass	Pressure boundary	Glass	Treated water (int)	None	None	VII.J.AP-51	3.3.1-117	A
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	A
Tank	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A

Table 3.3.2-19-26: Drywell Chilled Water System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A
Thermowell	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Tubing	Pressure boundary	Stainless steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A
Valve body	Pressure boundary	Carbon steel	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-202	3.3.1-45	A

Table 3.3.2-19-26: Drywell Chilled Water System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.F1.AP-109	3.3.1-79	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.C2.AP-43	3.3.1-72	A
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.AP-199	3.3.1-46	A
Valve body	Pressure boundary	Gray cast iron	Condensation (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-81	3.3.1-78	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.C2.A-50	3.3.1-72	A
Valve body	Pressure boundary	Gray cast iron	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	Condensation (ext)	Loss of material	External Surfaces Monitoring	--	--	G
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VII.C2.A-52	3.3.1-49	A

Table 3.3.2-19-27
Standby Diesel Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-27: Standby Diesel Generator System [10 CFR 54.4(a)(2)]

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	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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	C

Table 3.3.2-19-27: Standby Diesel Generator System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Piping	Pressure boundary	Carbon steel	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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Strainer housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Gray cast iron	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	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

Table 3.3.2-19-27: Standby Diesel Generator System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Tubing	Pressure boundary	Stainless steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Valve body	Pressure boundary	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C
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
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

Table 3.3.2-19-27: Standby Diesel Generator System [10 CFR 54.4(a)(2)]

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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
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	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-136	3.3.1-71	A, 303

Table 3.3.2-19-28
HPCS Diesel Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-28: HPCS Diesel Generator System [10 CFR 54.4(a)(2)]

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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.A-08	3.3.1-90	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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Raw water (int)	Loss of material	Service Water Integrity	VII.H2.AP-55	3.3.1-41	A

Table 3.3.2-19-28: HPCS Diesel Generator System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Flexible 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
Flexible 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	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	Carbon steel	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
Piping	Pressure boundary	Carbon steel	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

Table 3.3.2-19-28: HPCS Diesel Generator System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Strainer housing	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A
Strainer housing	Pressure boundary	Gray cast iron	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-105	3.3.1-70	A, 303
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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	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	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

Table 3.3.2-19-28: HPCS Diesel Generator System [10 CFR 54.4(a)(2)]								
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	C
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
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	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.G.AP-143	3.3.1-89	C
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Fuel oil (int)	Loss of material	Diesel Fuel Monitoring	VII.H1.AP-132	3.3.1-69	A, 303
Valve body	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Selective Leaching	VII.H1.AP-43	3.3.1-72	A

Table 3.3.2-19-28: HPCS Diesel Generator System [10 CFR 54.4(a)(2)]								
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	Water Chemistry Control – Closed Treated Water Systems	VII.H1.AP-199	3.3.1-46	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.H2.A-47	3.3.1-72	A, 305

Table 3.3.2-19-29
NobleChem Injection and Monitoring System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-29: NobleChem Injection and Monitoring System [10 CFR 54.4(a)(2)]

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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flexible connection	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
Flow element	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Flow element	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301
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 – Closed Treated Water Systems	VIII.E.S-25	3.4.1-26	C
Pump casing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A

Table 3.3.2-19-29: NobleChem Injection and Monitoring System [10 CFR 54.4(a)(2)]								
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 – BWR	VII.E3.AP-110	3.3.1-25	C, 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 water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VII.E3.AP-110	3.3.1-25	C, 301

Table 3.3.2-19-30
Auxiliary Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-30: Auxiliary Building Ventilation System [10 CFR 54.4(a)(2)]

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.B.E-25	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.B.E-25	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-30: Auxiliary Building Ventilation System [10 CFR 54.4(a)(2)]

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.D2.E-29	3.2.1-44	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 3.3.2-19-31
Fuel Handling Area Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-31: Fuel Handling Area Ventilation System [10 CFR 54.4(a)(2)]

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.B.E-25	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.B.E-25	3.2.1-44	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

Table 3.3.2-19-31: Fuel Handling Area Ventilation System [10 CFR 54.4(a)(2)]

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 (ext)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	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
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.B.E-25	3.2.1-44	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
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-31: Fuel Handling Area Ventilation System [10 CFR 54.4(a)(2)]

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.D2.E-29	3.2.1-44	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 3.3.2-19-32
Turbine Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-32: Turbine Building Ventilation System [10 CFR 54.4(a)(2)]

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.B.E-25	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.B.E-25	3.2.1-44	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

Table 3.3.2-19-32: Turbine Building Ventilation System [10 CFR 54.4(a)(2)]

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 (ext)	Cracking	External Surfaces Monitoring	VII.F2.AP-102	3.3.1-76	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
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.B.E-25	3.2.1-44	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.D2.E-29	3.2.1-44	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 3.3.2-19-32: Turbine Building Ventilation System [10 CFR 54.4(a)(2)]

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	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 3.3.2-19-33
Diesel Generator Building Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-33: Diesel Generator Building Ventilation System [10 CFR 54.4(a)(2)]

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
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F4.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.B.E-25	3.2.1-44	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.D2.E-29	3.2.1-44	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 3.3.2-19-34
Control Building HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-34: Control Building HVAC System [10 CFR 54.4(a)(2)]

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.F1.A-10	3.3.1-78	A
Blower housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	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
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.B.E-25	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

Table 3.3.2-19-34: Control Building HVAC System [10 CFR 54.4(a)(2)]

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	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	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 (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
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.B.E-25	3.2.1-44	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 3.3.2-19-34: Control Building HVAC System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Filter housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.F1.A-08	3.3.1-90	A
Humidifier housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.F1.A-10	3.3.1-78	A
Humidifier housing	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	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.D2.E-29	3.2.1-44	C

Table 3.3.2-19-34: Control Building HVAC System [10 CFR 54.4(a)(2)]

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-19-35
Sanitary Waste System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-35: Sanitary Waste System [10 CFR 54.4(a)(2)]

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	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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Valve body	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-35: Sanitary Waste System [10 CFR 54.4(a)(2)]								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Valve body	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.3.2-19-36
Control Room HVAC System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-36: Control Room HVAC System [10 CFR 54.4(a)(2)]

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
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.B.E-25	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.B.E-25	3.2.1-44	C

Table 3.3.2-19-36: Control Room HVAC System [10 CFR 54.4(a)(2)]

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 (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 (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
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.B.E-25	3.2.1-44	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VII.J.AP-123	3.3.1-120	A
Orifice	Pressure boundary	Stainless steel	Air – indoor (int)	None	None	VII.J.AP-123	3.3.1-120	A
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VII.I.A-77	3.3.1-78	A

Table 3.3.2-19-36: Control Room HVAC System [10 CFR 54.4(a)(2)]								
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.D2.E-29	3.2.1-44	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
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 3.3.2-19-37
Emergency Switchgear and Battery Rooms Ventilation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.3.2-19-37: Emergency Switchgear and Battery Rooms Ventilation System [10 CFR 54.4(a)(2)]								
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.B.E-25	3.2.1-44	C

3.4 STEAM AND POWER CONVERSION SYSTEMS

3.4.1 Introduction

This section provides the results of the aging management reviews for components in the steam and power conversion systems that are subject to aging management review. The following systems are addressed in this section (the system descriptions are available in the referenced section).

- Condensate and Refueling Water Storage and Transfer (Section 2.3.4.1)
- Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2) (Section 2.3.4.2)

Table 3.4.1, Summary of Aging Management Programs for Steam and Power Conversion System Evaluated in Chapter VIII of NUREG-1801, provides the summary of the programs evaluated in NUREG-1801 for the steam and power conversion system component group. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.4.2 Results

The following system tables summarize the results of aging management reviews and the NUREG-1801 comparison for the condensate storage system.

- Table 3.4.2-1 Condensate and Refueling Water Storage and Transfer System—Summary of Aging Management Evaluation

Miscellaneous Steam and Power Conversion Systems in Scope for 10 CFR 54.4(a)(2)

- Table 3.4.2-2-1 Feedwater Control System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-2-2 Main and Reheat Steam System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-2-3 Condensate and Feedwater System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-2-4 Condensate Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

- Table 3.4.2-2-17 Low Temperature Off Gas System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-2-18 Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation
- Table 3.4.2-2-19 Condensate and Refueling Water Storage and Transfer System, Nonsafety-Related Components Affecting Safety-Related Systems—Summary of Aging Management Evaluation

3.4.2.1 Materials, Environment, 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 Condensate and Refueling Water Storage and Transfer

Materials

Condensate and refueling water storage and transfer system components are constructed of the following materials.

- carbon steel
- copper alloy
- copper alloy > 15% zinc or > 8% aluminum
- gray cast iron
- stainless steel

Environment

Condensate and refueling water storage and transfer system components are exposed to the following environments.

- air – indoor
- air - outdoor
- concrete
- condensation
- soil
- treated water

Aging Effects Requiring Management

The following aging effects associated with the condensate and refueling water storage and transfer system require management.

- cracking
- loss of material
- loss of preload

Aging Management Programs

The following aging management programs manage the aging effects for the condensate and refueling water storage and transfer system components.

- Aboveground Metallic Tanks
- Bolting Integrity
- Buried Piping and Tanks Inspection
- Compressed Air Monitoring
- External Surfaces Monitoring
- One-Time Inspection
- Selective Leaching
- Water Chemistry Control – BWR

3.4.2.1.2 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 3.4.2-2-xx tables.

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
- nickel alloy
- stainless steel

Environment

Nonsafety-related components affecting safety-related systems are exposed to the following environments.

- air - indoor

- condensation
- 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 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 – BWR
- Water Chemistry Control – Closed Treated Water Systems

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 GGNS site is not conducive to stress corrosion cracking. The GGNS site is not near a saltwater coastline and is not near highways treated with salt in the wintertime. Soil in the vicinity of the site contains no more than trace quantities of chlorides. The GGNS site is in an isolated location, away from agricultural or industrial sources of chloride contamination. The GGNS cooling tower uses water treated with hypochlorite solution; however, cooling tower drift rarely settles near plant equipment. 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 GGNS, there are no stainless steel components of the steam and power conversion systems included in the scope of license renewal that are located 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. 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 GGNS, there are no stainless steel components of the 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 GGNS 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 Systems 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	PWR only				
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 and stainless steel bolting exposed to soil is managed by the Bolting Integrity Program.
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	This item was not used. There is no high strength 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
3.4.1-8	Steel; stainless steel bolting, closure bolting exposed to air – outdoor (external), air – indoor, uncontrolled (external)	Loss of material due to general (steel only), pitting, and crevice corrosion	Chapter XI.M18, "Bolting Integrity"	No	Consistent with NUREG-1801. Loss of material for steel and stainless steel closure bolting exposed to indoor and outdoor air is managed by the Bolting Integrity Program.
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	This item was not used. 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 – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control 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 or stainless steel tanks exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.
3.4.1-13	PWR only				

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-14	Steel piping, piping components, and piping elements, PWR heat exchanger components exposed to steam, treated water	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One- Time Inspection"	No	Consistent with NUREG-1801. Loss of material for steel components exposed to steam or treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.
3.4.1-15	Steel heat exchanger components exposed to treated water	Loss of material due to general, pitting, crevice, and galvanic corrosion	Chapter XI.M2, "Water Chemistry," and Chapter XI.M32, "One- Time Inspection"	No	Consistent with NUREG-1801. Loss of material for steel heat exchanger components exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-16	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 copper alloy and stainless steel components exposed to steam or treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage loss of material. There are no nickel alloy or aluminum components exposed to treated water in the steam and power conversion systems in the scope of license renewal.
3.4.1-17	PWR only				

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-18	Copper alloy, stainless steel heat exchanger tubes exposed to treated water	Reduction of heat transfer due to fouling	Chapter XI.M2, “Water Chemistry,” and Chapter XI.M32, “One- Time Inspection”	No	Consistent with NUREG-1801. Fouling of copper alloy heat exchanger tubes exposed to treated water is managed by the Water Chemistry Control – BWR Program. The One-Time Inspection Program will verify the effectiveness of the water chemistry control program to manage fouling. This item applies to components in 3.2.2-1. There are no stainless steel heat exchanger tubes exposed to treated water 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	Loss of material for steel circulating water system components exposed to raw water will be managed by the Internal Surfaces in Miscellaneous Piping and Ducting Components or Periodic Surveillance and Preventive Maintenance Programs. 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.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-20	Copper alloy, stainless steel piping, piping components, and piping elements exposed to raw water	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M20, "Open-Cycle Cooling Water System"	No	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.
3.4.1-21	PWR only				
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	This item was not used. 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	This item was not used. 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	Consistent with NUREG-1801. Loss of material for steel heat exchanger components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-25	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	Consistent with NUREG-1801. Loss of material for steel heat exchanger components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
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	Consistent with NUREG-1801. Loss of material for stainless steel heat exchanger components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.
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	Consistent with NUREG-1801. Loss of material for copper alloy components exposed to closed-cycle cooling water is managed by the Water Chemistry Control – Closed Treated Water Systems Program.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-28	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	This item was not used. There are no heat exchanger tubes exposed to closed-cycle cooling water with an intended function of heat transfer in the steam and power conversion systems in the scope of license renewal.
3.4.1-29	Steel tanks exposed to air – outdoor (external)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M29, “Aboveground Metallic Tanks”	No	This item was not used. There are no steel tanks exposed to outdoor air in the steam and power conversion systems in the scope of license renewal.
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 and stainless steel tanks exposed to outdoor air is managed by the Aboveground Metallic Tanks Program. There are no aluminum tanks or tanks 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
3.4.1-31	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 is managed by the Aboveground Metallic Tanks Program. There are no aluminum tanks or tanks exposed to 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.
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.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-34	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	This item was not used. There are no aluminum components exposed to outdoor air in the steam and power conversion systems in the scope of license renewal.
3.4.1-36	PWR only				
3.4.1-37	PWR only				
3.4.1-38	PWR only				
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	This item was not used. 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 System as identified in Table Item 3.3.1-56.

Table 3.4.1: Steam and Power Conversion Systems					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.4.1-40	Steel piping, piping components, and piping elements exposed to lubricating oil	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, "One-Time Inspection"	No	Consistent with NUREG-1801 for most components. 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. The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages loss of material for a generator system fan housing exposed to lube oil.
3.4.1-41	PWR only				
3.4.1-42	PWR only				
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.

Table 3.4.1: Steam and Power Conversion Systems

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.4.1-44	Stainless steel piping, piping components, and piping elements, heat exchanger components exposed to lubricating oil	Loss of material due to pitting, crevice, and microbiologically influenced corrosion	Chapter XI.M39, "Lubricating Oil Analysis," and Chapter XI.M32, “One-Time Inspection”	No	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to lube oil is managed by the Oil Analysis Program. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program to manage loss of material.
3.4.1-45	PWR only				
3.4.1-46	PWR only				
3.4.1-47	Steel (with coating or wrapping) 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 Piping and Tanks Inspection Program. There are no steel tanks exposed to soil or concrete in the steam and power conversion systems in the scope of license renewal.
3.4.1-48	Stainless steel bolting exposed to soil	Loss of material due to pitting and crevice corrosion	Chapter XI.M41, "Buried and Underground Piping and Tanks"	No	Consistent with NUREG-1801. Loss of material for stainless steel bolting exposed to soil is managed by the Buried 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
3.4.1-49	Stainless steel 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	Consistent with NUREG-1801. Loss of material for stainless steel components exposed to soil is managed by the Buried Piping and Tanks Inspection Program.
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 Piping and Tanks Inspection Program.
3.4.1-50.5	Underground stainless steel and 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	This item was not used. 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.	This item was not used. There are no steel components embedded in concrete 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
3.4.1-52	Aluminum piping, piping components, and piping elements exposed to gas, air – indoor, uncontrolled (internal/external)	None	None	NA – No AEM or AMP	This item was not used. There are no aluminum components in the steam and power conversion systems in the scope of license renewal.
3.4.1-53	PWR only				
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, lube oil, 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	This item was not used. 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	This item was not used. There are no steel steam and power conversion system components exposed to the environments represented by this item, in the scope of license renewal.

Notes for Table 3.4.2-1 through Table 3.4.2-2-19

Generic Notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

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 – BWR Program.

402. The One-Time Inspection Program will verify the effectiveness of the Oil Analysis Program.

Table 3.4.2-1
Condensate and Refueling Water Storage and Transfer System
Summary of Aging Management Evaluation

Table 3.4.2-1: Condensate and Refueling Water Storage and Transfer System								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	C
Accumulator	Pressure boundary	Stainless steel	Condensation	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
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 Piping and Tanks Inspection	VIII.H.SP-141	3.4.1-50	A
Bolting	Pressure boundary	Carbon steel	Soil (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-142	3.4.1-6	A
Bolting	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	C, 401

Table 3.4.2-1: Condensate and Refueling Water Storage and Transfer 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	Treated water (ext)	Loss of preload	Bolting Integrity	VII.I.AP-267	3.3.1-15	C
Bolting	Pressure boundary	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Bolting Integrity	VIII.H.SP-82	3.4.1-8	A
Bolting	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-151	3.4.1-10	A
Bolting	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VIII.H.SP-143	3.4.1-48	A
Bolting	Pressure boundary	Stainless steel	Soil (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-144	3.4.1-6	A
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	C, 401
Bolting	Pressure boundary	Stainless steel	Treated water (ext)	Loss of preload	Bolting Integrity	VII.I.AP-267	3.3.1-15	C
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 – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-1: Condensate and Refueling Water Storage and Transfer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Piping	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VIII.E.SP-145	3.4.1-47	A
Piping	Pressure boundary	Carbon steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.E.SP-118	3.4.1-2	A
Piping	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.E.SP-127	3.4.1-3	A
Piping	Pressure boundary	Stainless steel	Soil (ext)	Loss of material	Buried Piping and Tanks Inspection	VIII.E.SP-94	3.4.1-49	A
Piping	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	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 3.4.2-1: Condensate and Refueling Water Storage and Transfer 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	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 – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Rupture disc	Pressure boundary	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Rupture disc	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Strainer	Filtration	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Strainer	Filtration	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Tank	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.E.SP-118	3.4.1-2	A
Tank	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-138	3.4.1-30	A
Tank	Pressure boundary	Stainless steel	Concrete (ext)	Loss of material	Aboveground Metallic Tanks	VIII.E.SP-137	3.4.1-31	A

Table 3.4.2-1: Condensate and Refueling Water Storage and Transfer 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	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 – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-240	3.3.1-54	C
Tubing	Pressure boundary	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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	Condensation (int)	Loss of material	Compressed Air Monitoring	VII.D.AP-81	3.3.1-56	C
Tubing	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-1: Condensate and Refueling Water Storage and Transfer 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	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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	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 – BWR	VIII.A.SP-101	3.4.1-16	C, 401
Valve body	Pressure boundary	Gray cast iron	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-41	3.4.1-34	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VIII.E.SP-27	3.4.1-33	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-1: Condensate and Refueling Water Storage and Transfer System

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Cracking	External Surfaces Monitoring	VIII.E.SP-118	3.4.1-2	A
Valve body	Pressure boundary	Stainless steel	Air – outdoor (ext)	Loss of material	External Surfaces Monitoring	VIII.E.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 – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Vortex breaker	Flow control	Stainless steel	Treated water (ext)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Vortex breaker	Flow control	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-2-1
Feedwater Control System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-1: 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
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
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2.S-11	3.4.1-1	A
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.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)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2.S-11	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-73	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

Table 3.4.2-2-1: 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	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.D2.S-11	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-2
Main and Reheat Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-2: Main and Reheat 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.B2.S-08	3.4.1-1	A
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	A, 401
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.4.2-2-2: Main and Reheat 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	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	A
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.4.2-2-2: Main and Reheat 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	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	C, 401
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.B2.S-08	3.4.1-1	A
Rupture disc	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	A
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-73	3.4.1-14	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	A, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	H

Table 3.4.2-2-2: Main and Reheat 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	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	A, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	A
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C

Table 3.4.2-2-2: Main and Reheat 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 – BWR	VIII.B2.SP-73	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	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 – BWR	VIII.A.SP-101	3.4.1-16	C, 401

Table 3.4.2-2-3
Condensate and Feedwater System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-3: Condensate and 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
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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	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	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Duct	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Duct	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Expansion joint	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-2-3: Condensate and 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
Expansion joint	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Expansion joint	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Expansion joint	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Expansion joint	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401
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.E.SP-91	3.4.1-40	A, 402
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Filter housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-3: Condensate and 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
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Filter housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Filter housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Filter housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	C
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 3.4.2-2-3: Condensate and 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 (bonnet)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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	Water Chemistry Control – BWR	VIII.B2.SP-160	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	Lube oil (int)	Loss of material	Oil Analysis	VIII.E.SP-91	3.4.1-40	A, 402
Orifice	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	C
Orifice	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-3: Condensate and 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
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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-3: Condensate and 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	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	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 – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Separator	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Separator	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 3.4.2-2-3: Condensate and 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
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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	A, 402
Tank	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	A, 401
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-2-3: Condensate and 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
Tank	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-97	3.4.1-11	A, 401
Tank	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	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 – BWR	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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C

Table 3.4.2-2-3: Condensate and 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
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	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 – BWR	VIII.B2.SP-160	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	Lube oil (int)	Loss of material	Oil Analysis	VIII.E.SP-91	3.4.1-40	A, 402
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-2-3: Condensate and 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	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	A, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-2-4
Condensate Cleanup System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-4: Condensate Cleanup System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Accumulator	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Accumulator	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	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	Stainless steel	Air – indoor (ext)	Loss of preload	Bolting Integrity	VIII.H.SP-83	3.4.1-10	A
Demineralizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Demineralizer	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
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 – BWR	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-4: Condensate Cleanup System, Nonsafety-Related Components 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	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 – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 3.4.2-2-4: Condensate Cleanup System, Nonsafety-Related Components 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 – BWR	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 – BWR	VIII.E.SP-73	3.4.1-14	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 – BWR	VIII.E.SP-87	3.4.1-16	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	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	A, 401
Tank	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tank	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	A, 401

Table 3.4.2-2-4: Condensate Cleanup System, Nonsafety-Related Components 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 – BWR	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 – BWR	VIII.E.SP-73	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	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 – BWR	VIII.A.SP-101	3.4.1-16	C, 401
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Selective Leaching	VII.E3.AP-31	3.3.1-72	C
Valve body	Pressure boundary	Gray cast iron	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-4: Condensate Cleanup System, Nonsafety-Related Components 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	A, 401

Table 3.4.2-2-5
Heater, Vents, and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-5: Heater, Vents, 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
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	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Expansion joint	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C

Table 3.4.2-2-5: Heater, Vents, 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
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	3.4.1-14	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 3.4.2-2-5: Heater, Vents, 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
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Sight glass	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	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	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401

Table 3.4.2-2-5: Heater, Vents, 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
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	A, 401
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	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

Table 3.4.2-2-5: Heater, Vents, 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	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 – BWR	VIII.A.SP-101	3.4.1-16	C, 401

Table 3.4.2-2-6
Main Turbine and Auxiliaries
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-6: Main Turbine and Auxiliaries, Nonsafety-Related Components 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.A.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.A.SP-91	3.4.1-40	A, 402
Filter housing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Filter housing	Pressure boundary	Stainless steel	Lube oil (int)	Cracking	Oil Analysis	--	--	H

Table 3.4.2-2-6: Main Turbine and Auxiliaries, Nonsafety-Related Components 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.A.S-23	3.4.1-24	A
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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.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.A.SP-91	3.4.1-40	A, 402
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A.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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	A, 402

Table 3.4.2-2-6: Main Turbine and Auxiliaries, Nonsafety-Related Components 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.A.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.A.SP-95	3.4.1-44	A, 402
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 – BWR	VIII.A.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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	A, 402
Valve body	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.A.SP-71	3.4.1-14	A, 401

Table 3.4.2-2-6: Main Turbine and Auxiliaries, Nonsafety-Related Components 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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.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
Valve body	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	A, 402

Table 3.4.2-2-7
Main and RFP Turbine Seal Steam and Drain System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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
Duct	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Duct	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.B.E-25	3.2.1-44	C
Flexible connection	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Flexible connection	Pressure boundary	Carbon steel	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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	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.B2.S-08	3.4.1-1	C
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	C
Flow element	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 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	Water Chemistry Control – BWR	VIII.E.SP-77	3.4.1-15	C, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-77	3.4.1-15	C, 401

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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 – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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.B2.S-15	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-73	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
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	Air – indoor (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	V.D2.E-29	3.2.1-44	C
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 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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 – BWR	VIII.D2.SP-73	3.4.1-14	C, 401
Sight glass	Pressure boundary	Carbon steel	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	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
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	C
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	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	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	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-87	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	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-87	3.4.1-16	C, 401

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.B2.S-15	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-73	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
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 – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G

Table 3.4.2-2-7: Main and RFP Turbine Seal Steam and Drain System, Nonsafety-Related Components 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 – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-87	3.4.1-16	C, 401

Table 3.4.2-2-8
Lube Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-8: Lube 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
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.A.SP-91	3.4.1-40	C, 402
Blower housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Blower housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 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
Filter housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Filter housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A

Table 3.4.2-2-8: Lube 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**
Flexible connection	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
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	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 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.A.SP-91	3.4.1-40	C, 402
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 3.4.2-2-8: Lube 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	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VIII.I.SP-10	3.4.1-55	A
Strainer 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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
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
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 3.4.2-2-8: Lube 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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402

Table 3.4.2-2-9
Moisture Separator-Reheater Vents and Drains System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-9: Moisture Separator-Reheater Vents 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
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	3.4.1-14	A, 401
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401

Table 3.4.2-2-9: Moisture Separator-Reheater Vents 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
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	A, 401
Separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-2-9: Moisture Separator-Reheater Vents 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
Separator	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-75	3.4.1-12	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	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	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 – BWR	VIII.A.SP-101	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C

Table 3.4.2-2-9: Moisture Separator-Reheater Vents 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	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	3.4.1-14	A, 401
Valve body	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	A, 401

Table 3.4.2-2-10
Extraction Steam System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-10: 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
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	Steam (int)	Cracking	Water Chemistry Control – BWR	--	--	G
Expansion joint	Pressure boundary	Nickel alloy	Steam (int)	Loss of material	Water Chemistry Control – BWR	--	--	G
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 – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Orifice	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401

Table 3.4.2-2-10: 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
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.B2.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 – BWR	VIII.C.SP-71	3.4.1-14	A, 401
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Piping	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Piping	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401

Table 3.4.2-2-10: 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
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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Strainer housing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	A, 401
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking	Water Chemistry Control – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Thermowell	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	A, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	A, 401

Table 3.4.2-2-10: 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
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 – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G
Tubing	Pressure boundary	Stainless steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.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.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Flow-Accelerated Corrosion	VIII.C.S-15	3.4.1-5	A
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-71	3.4.1-14	A, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-73	3.4.1-14	A, 401

Table 3.4.2-2-11
Turbine Bypass System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-11: Turbine Bypass System, Nonsafety-Related Components 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	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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Orifice	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.D2.SP-87	3.4.1-16	C, 401

Table 3.4.2-2-11: Turbine Bypass System, Nonsafety-Related Components 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	VIII.H.S-29	3.4.1-34	A
Piping	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	C, 401

**Table 3.4.2-2-12
Generator System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation**

Table 3.4.2-2-12: 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	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
Fan housing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Fan housing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.A.SP-91	3.4.1-40	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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Sight glass	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402

Table 3.4.2-2-12: 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
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A
Sight glass	Pressure boundary	Glass	Lube oil (int)	None	None	VIII.I.SP-10	3.4.1-55	A

Table 3.4.2-2-13
Seal Oil System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-13: Seal 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	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.A.SP-91	3.4.1-40	C, 402
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	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C

Table 3.4.2-2-13: Seal 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**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	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	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	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Pump casing	Pressure boundary	Carbon steel	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-91	3.4.1-40	C, 402

Table 3.4.2-2-13: Seal 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	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
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.A.SP-91	3.4.1-40	C, 402
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
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)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 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.A.SP-91	3.4.1-40	C, 402
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

Table 3.4.2-2-13: Seal 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	Copper alloy > 15% Zn or > 8% Al	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-92	3.4.1-43	C, 402
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)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402

Table 3.4.2-2-14
Generator Primary Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-14: Generator Primary 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
Demineralizer	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Demineralizer	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
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 – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C

Table 3.4.2-2-14: Generator Primary 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
Flexible connection	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Flexible connection	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.SP-39	3.4.1-26	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
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	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
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

Table 3.4.2-2-14: Generator Primary 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**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.SP-39	3.4.1-26	C
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 – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	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	Lube oil (int)	Loss of material	Oil Analysis	VIII.A.SP-95	3.4.1-44	C, 402
Pump casing	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-2-14: Generator Primary 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
Pump casing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
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	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A

Table 3.4.2-2-14: Generator Primary 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	Copper alloy	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.SP-8	3.4.1-27	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.SP-39	3.4.1-26	C
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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.SP-39	3.4.1-26	C

Table 3.4.2-2-15
Excitation System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-15: Excitation System, Nonsafety-Related Components 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	Treated water (int)	Loss of material	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-77	3.4.1-15	C, 401

Table 3.4.2-2-16
Condenser Air Removal System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-16: Condenser Air Removal System, Nonsafety-Related Components Affecting Safety-Related Systems								
Component Type	**Intended Function**	**Material**	**Environment**	**Aging Effect Requiring Management**	**Aging Management Program**	**NUREG-1801 Item**	**Table 1 Item**	**Notes**
Bolting	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	Bolting Integrity	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	Condensation (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-280	3.3.1-95	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Flow element	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	C, 401

Table 3.4.2-2-16: Condenser Air 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**
Heat exchanger (shell)	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Heat exchanger (shell)	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-77	3.4.1-15	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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Orifice	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.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	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	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C

Table 3.4.2-2-16: Condenser Air 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
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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
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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Piping	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	C, 401
Separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A

Table 3.4.2-2-16: Condenser Air 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**
Separator	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 – BWR	VIII.E.SP-73	3.4.1-14	C, 401
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	VIII.I.SP-6	3.4.1-54	A
Sight glass	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
Sight glass	Pressure boundary	Copper alloy > 15% Zn or > 8% Al	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.A.SP-101	3.4.1-16	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

Table 3.4.2-2-16: Condenser Air 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
Sight glass	Pressure boundary	Glass	Waste water (int)	None	None	VII.J.AP-277	3.3.1-119	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	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Strainer housing	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Thermowell	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	C, 401
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	Waste water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.E5.AP-281	3.3.1-91	C

Table 3.4.2-2-16: Condenser Air 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	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 – BWR	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 > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.E.SP-88	3.4.1-11	C, 401
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Tubing	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-87	3.4.1-16	C, 401
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	VIII.H.S-29	3.4.1-34	A
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	C

Table 3.4.2-2-16: Condenser Air 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
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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
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 – BWR	VIII.A.SP-101	3.4.1-16	C, 401

Table 3.4.2-2-17
Low Temperature Off Gas System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-17: Low Temperature Off Gas System, Nonsafety-Related Components 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
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	Water Chemistry Control – Closed Treated Water Systems	VIII.E.S-23	3.4.1-25	C
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.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401

Table 3.4.2-2-17: Low Temperature Off Gas System, Nonsafety-Related Components 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.B2.S-08	3.4.1-1	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Flow-Accelerated Corrosion	VIII.E.S-16	3.4.1-5	C
Piping	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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
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 – BWR	VIII.E.SP-87	3.4.1-16	C, 401
Separator	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Separator	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	C, 401
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)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C

Table 3.4.2-2-17: Low Temperature Off Gas System, Nonsafety-Related Components 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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 – BWR	VIII.E.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	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Steam (int)	Loss of material	Water Chemistry Control – BWR	VIII.B2.SP-160	3.4.1-14	C, 401
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Cracking – fatigue	TLAA – metal fatigue	VIII.B2.S-08	3.4.1-1	C
Valve body	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	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 – BWR	VIII.B2.SP-98	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Steam (int)	Cracking – fatigue	TLAA – metal fatigue	--	--	G

Table 3.4.2-2-17: Low Temperature Off Gas System, Nonsafety-Related Components 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 – BWR	VIII.B2.SP-155	3.4.1-16	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking	Water Chemistry Control – BWR	VIII.C.SP-88	3.4.1-11	C, 401
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Cracking – fatigue	TLAA – metal fatigue	VII.E3.A-62	3.3.1-2	C
Valve body	Pressure boundary	Stainless steel	Treated water > 140ºF (int)	Loss of material	Water Chemistry Control – BWR	VIII.C.SP-87	3.4.1-16	C, 401

Table 3.4.2-2-18
Circulating Water System
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-18: 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	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
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

Table 3.4.2-2-18: 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**
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.E.SP-146	3.4.1-19	E
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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-146	3.4.1-19	E
Orifice	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Orifice	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
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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-146	3.4.1-19	E

Table 3.4.2-2-18: 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	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E.SP-146	3.4.1-19	E
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
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.E.SP-146	3.4.1-19	E
Sight glass	Pressure boundary	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Sight glass	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-146	3.4.1-19	E
Sight glass	Pressure boundary	Glass	Air – indoor (ext)	None	None	VIII.I.SP-9	3.4.1-55	A

Table 3.4.2-2-18: Circulating Water System, Nonsafety-Related Components Affecting Safety-Related Systems

Component Type	Intended Function	Material	Environment	Aging Effect Requiring Management	Aging Management Program	NUREG-1801 Item	Table 1 Item	Notes
Sight glass	Pressure boundary	Glass	Raw water (int)	None	None	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.E.SP-146	3.4.1-19	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-146	3.4.1-19	E
Thermowell	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Thermowell	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
Tubing	Pressure boundary	Copper alloy	Air – indoor (ext)	None	None	VIII.I.SP-6	3.4.1-54	A

Table 3.4.2-2-18: 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**
Tubing	Pressure boundary	Copper alloy	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-31	3.4.1-20	E
Tubing	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Tubing	Pressure boundary	Stainless steel	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	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-146	3.4.1-19	E
Valve body	Pressure boundary	Carbon steel	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E.SP-146	3.4.1-19	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

Table 3.4.2-2-18: 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	Copper alloy > 15% Zn or > 8% Al	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.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.E.SP-30	3.4.1-33	C
Valve body	Pressure boundary	Gray cast iron	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Internal Surfaces in Miscellaneous Piping and Ducting Components	VIII.E.SP-146	3.4.1-19	E
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Periodic Surveillance and Preventive Maintenance	VIII.E.SP-146	3.4.1-19	E
Valve body	Pressure boundary	Gray cast iron	Raw water (int)	Loss of material	Selective Leaching	VIII.A.SP-28	3.4.1-33	C

Table 3.4.2-2-19
Condensate and Refueling Water Storage and Transfer System,
Nonsafety-Related Components Affecting Safety-Related Systems
Summary of Aging Management Evaluation

Table 3.4.2-2-19: Condensate and Refueling Water Storage and Transfer System, Nonsafety-Related Components 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	Carbon steel	Air – indoor (ext)	Loss of material	External Surfaces Monitoring	VIII.H.S-29	3.4.1-34	A
Expansion joint	Pressure boundary	Carbon steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	3.4.1-14	A, 401
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

Table 3.4.2-2-19: Condensate and Refueling Water Storage and Transfer System, Nonsafety-Related Components 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	Treated water (int)	Change in material properties	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.A4.AP-101	3.3.1-86	C
Expansion joint	Pressure boundary	Elastomer	Treated water (int)	Cracking	Internal Surfaces in Miscellaneous Piping and Ducting Components	VII.A4.AP-101	3.3.1-86	C
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 – BWR	VIII.E.SP-73	3.4.1-14	A, 401
Piping	Pressure boundary	Stainless steel	Air – indoor (ext)	None	None	VIII.I.SP-12	3.4.1-58	A
Piping	Pressure boundary	Stainless steel	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	VIII.E.SP-73	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

Table 3.4.2-2-19: Condensate and Refueling Water Storage and Transfer System, Nonsafety-Related Components 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 – BWR	VIII.E.SP-73	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	Treated water (int)	Loss of material	Water Chemistry Control – BWR	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 – BWR	VIII.E.SP-73	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	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 – BWR	VIII.A.SP-101	3.4.1-16	C, 401

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).

- Containment Building (Section 2.4.1)
- Water Control Structures (Section 2.4.2)
- Turbine Building, Process Facilities, and Yard 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 Containment 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, Process Facilities, and Yard Structures—Summary of Aging Management Evaluation
- Table 3.5.2-4 Bulk Commodities—Summary of Aging Management Evaluation

3.5.2.1 Materials, Environment, 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 Containment Building

Materials

Containment building components are constructed of the following materials.

- carbon steel
- coating
- concrete
- concrete block
- elastomer
- galvanized steel
- stainless steel

Environment

Containment building components are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- exposed to fluid environment
- soil

Aging Effects Requiring Management

The following aging effects associated with the containment building require management.

- change in material properties
- cracking
- loss of coating integrity
- loss of material

Aging Management Programs

The following programs are credited for managing the effects of aging on containment building components.

- Containment Inservice Inspection – IWE
- Containment Inservice Inspection – IWL
- Containment Leak Rate
- 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
- Water Chemistry Control – BWR

3.5.2.1.2 Water Control Structures

Materials

Water control structure components are constructed of the following materials.

- carbon steel
- ceramic tile
- concrete
- concrete block
- fiber reinforced polyester
- galvanized steel
- rock/stone/soil
- stainless steel

Environment

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.

- cracking
- loss of form
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on water control structure components.

- Masonry Wall
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Structures Monitoring

3.5.2.1.3 Turbine Building, Process Facilities, and Yard Structures

Materials

Turbine building, process facilities and yard structure components are constructed of the following materials.

- aluminum
- carbon steel
- concrete
- concrete block
- galvanized steel
- stainless steel
- treated wood

Environment

Turbine building, process facility, and yard structure components are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- exposed to fluid environment
- soil

Aging Effects Requiring Management

The following aging effects associated with the turbine building, process facilities, and yard structures require management.

- change in material properties
- cracking
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the turbine building, process facility, and yard structure components.

- Fire Protection
- Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems
- Masonry Wall
- Structures Monitoring
- Water Chemistry Control – BWR

3.5.2.1.4 Bulk Commodities

Materials

Bulk commodity components are constructed of the following materials.

- aluminum
- carbon steel
- cerafiber, cera blanket
- coating
- concrete
- elastomer
- fiberglass/ calcium silicate
- galvanized steel
- pyrocrete
- rubber
- sand bags
- sealant
- stainless steel
- wood

Environment

Bulk commodity components are exposed to the following environments.

- air – indoor uncontrolled
- air – outdoor
- exposed to fluid environment

Aging Effects Requiring Management

The following aging effects associated with bulk commodities require management.

- change in material properties
- cracking
- cracking/delamination/separation
- loss of coating integrity
- loss of material

Aging Management Programs

The following aging management programs manage the effects of aging on the bulk commodity components.

- Fire Protection
- Fire Water System

- Inservice Inspection – IWF
- Protective Coating Monitoring and Maintenance
- RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants
- Structures Monitoring
- Water Chemistry Control – BWR

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 GGNS 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

GGNS does not rely on a dewatering system for control of settlement. Category I structures, except the diesel generator building which is founded on compacted structural backfill, are founded on the Catahoula Formation. The Catahoula Formation of Miocene age consists primarily of hard-to-very-hard silty-to-sandy clay, clayey silt, and locally indurated or cemented clay, silt, and sand layers. The maximum settlement expected is less than one inch. This settlement is elastic and was determined to have occurred when the load was applied during initial construction. After construction was completed, onsite monitoring for potential settlement of Category I structures has been shown to be negligible. GGNS containment does not use a porous concrete subfoundation or rely on a dewatering system and was not identified in Information Notice (IN) 97-11 as a plant susceptible to erosion of porous concrete subfoundations. GGNS groundwater is not aggressive and there is no indication that groundwater chemistry has significantly changed and no changes in groundwater conditions have been observed. Potential total and differential settlements is addressed in the design of foundations at the site. A settlement monitoring program was established to monitor settlement of the Category I structures during plant construction and thereafter.

As a result, cracking and distortion due to increased stress level from settlement; reduction of foundation strength, and cracking due to differential settlement and erosion of porous concrete subfoundation are not aging effects requiring management for GGNS concrete structures. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection – IWL Program.

3.5.2.2.1.2 Reduction of Strength and Modulus due to Elevated Temperature

During normal operation, areas within containment are maintained below a bulk average temperature of 135ºF. The concrete in the cylinder wall for piping penetrations carrying hot fluid (pipe temperature > 200ºF), piping penetrations cooling is provided by either cooing fins or water jackets to maintain the concrete temperature adjoining the embedded sleeve at or below 200 F. Therefore, change in material properties due to elevated temperature is not an aging effect requiring management for containment concrete.

The aging effect "change in material properties" is equivalent to the NUREG-1801 aging effect "reduction of strength and modulus of elasticity. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection – IWL and Structures Monitoring Program.

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.

   GGNS is a Mark III containment structure constructed of reinforced concrete with a steel liner and does not have a drywell shell, embedded shell or region shielded by diaphragm floors. To prevent corrosion of the inaccessible areas of the lower portion (basemat area) of the containment liner plate, the interior and exterior surfaces are protected from contact with the atmosphere by complete concrete encasement. It is not credible for ground water to reach this portion of the liner plate, assuming a crack in the concrete, since the basemat concrete at this location is greater than five feet thick and poured in multiple horizontal planes. Additionally a waterproof membrane and work-slab is constructed below this area. Therefore, corrosion of the liner plate is not expected. Interior concrete is monitored for cracks under the Structures Monitoring Program. The steel liner plate and areas where the steel liner becomes embedded in the concrete floor is inspected in accordance with the Containment Inservice Inspection – IWE and Containment Leak Rate Programs.

2. Loss of material due to general, pitting, and crevice corrosion could occur in steel torus shell of Mark I containments.

   GGNS is a Mark III containment structure constructed of reinforced concrete and does not have a steel torus shell. Therefore, loss of material due to general, pitting, and crevice corrosion which may occur in the steel torus shell of Mark I containments does not apply.

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.

   GGNS is a Mark III concrete containment with a steel liner and suppression chamber. The containment does not have a torus ring girder or downcomers. Nonetheless the steel liner plate, suppression pool interior surface, and areas where the steel liner becomes embedded in the concrete floor is inspected in accordance with the Containment Inservice Inspection – IWE Program for other aging effects such as, loss of material for this grouping.

3.5.2.2.1.4 Loss of Prestress due to Relaxation, Shrinkage, Creep, and Elevated Temperature

The GGNS containment structure is constructed of reinforced concrete with no prestressed tendons associated with its design. Therefore, loss of prestress due to relaxation, shrinkage, creep, and elevated temperature do not apply.

3.5.2.2.1.5 Cumulative Fatigue Damage

TLAA are evaluated in accordance with 10 CFR 54.21(c) as documented in Section 4. Fatigue TLAAs for containment steel liner, bellows, dissimilar welds for flued heads to the penetration sleeves and associated penetrations are evaluated as documented in Section 4.6. Other containment mechanical penetration bellows that are located outside the containment building and have been screened out of scope because they do not perform a pressure boundary intended function and no fatigue analysis exist.

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 GGNS containment.

3.5.2.2.1.6 Cracking due to Stress Corrosion Cracking

NUREG-1801 recommends further evaluation of inspection methods to detect cracking due to SCC since visual VT-3 examinations may be unable to detect this aging effect. Potentially susceptible components at GGNS are penetration sleeves and bellows.

Stress corrosion cracking (SCC) is an aging mechanism that requires the simultaneous action of an aggressive chemical environment, sustained tensile stress, and a susceptible material. Elimination of any one of these elements will eliminate susceptibility to SCC. Stainless steel elements of containment, including dissimilar welds, are not susceptible to SCC, because, these elements are not subject to an aggressive chemical environment. A review of plant operating experience did not identify cracking of these components, and containment pressure boundary functions have not been identified as a concern. The absence of SCC aging effects is confirmed under the Fatigue Monitoring, Containment Inservice Inspection – IWE and Containment Leak Rate Programs.

3.5.2.2.1.7 Loss of Material (Scaling, Spalling) and Cracking due to Freeze-Thaw

GGNS inaccessible and accessible concrete areas are designed in accordance with American Concrete Institute (ACI) specification ACI 318, Building Code Requirements for Reinforced Concrete, which results in low permeability and resistance to aggressive chemical solutions. Concrete quality was determined by following guidance as specified in ACI 318 Subsection 4.2.5 and Table 4.2.5.

GGNS concrete also meets requirements of guidance provided in American Society for Testing and Material (ASTM) standards for selection, application and testing of concrete and concrete aggregate. Therefore, loss of material (scaling, spalling) and cracking due to freeze thaw is not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection – IWL and Structures Monitoring Program.

3.5.2.2.1.8 Cracking due to Expansion from Reaction with Aggregate

In accordance with NUREG-1801, aging management is not required because GGNS containment concrete (walls, dome, and basemat ring girder) is designed in accordance with specification ACI 318, Building Code Requirements for Reinforced Concrete and concrete specification requires that the potential reactivity of aggregates be tested in accordance with ASTM C 289 and ASTM C 227. Also ASTM C 295 was used to identify elements in the aggregate which may be unfavorably reactive with alkalis in cement. Concrete structures are not exposed to flowing water and the concrete used was constructed in accordance with the recommendations in ACI 318 Subsection 4.2.5 for concrete quality. Therefore, cracking due to expansion from reaction with aggregate is not an applicable aging mechanism for GGNS concrete structures. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection – IWL and Structures Monitoring Programs.

3.5.2.2.1.9 Increase in Porosity and Permeability due to Leaching of Calcium Hydroxide and Carbonation

GGNS below-grade environment is not aggressive (pH > 5.5, chlorides < 500 ppm, and sulfates < 1,500 ppm). Concrete was provided with at least the minimum required air content and a low water/cement ratio as specified in ACI 318. Therefore, increase in porosity and permeability due to leaching of calcium hydroxide and carbonation are not applicable for concrete in inaccessible areas. The absence of concrete aging effects is confirmed under the Containment Inservice Inspection – IWL and Structures Monitoring Programs.

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

   Aggregates were in accordance with specifications and materials conforming to ACI and ASTM standards. GGNS 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. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for GGNS Groups 1–3, 5, 7–9 structures. The absence of concrete aging effects is confirmed under Containment Inservice Inspection – IWL and Structures Monitoring Programs.

2. Cracking Due to Expansion and Reaction with Aggregates in Below Grade Inaccessible Concrete Areas for Groups 1–5, 7–9 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. GGNS 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 were within the limits provided in ACI 318. Therefore, cracking due to expansion and reaction with aggregates for Groups 1–5, 7–9 structures is not an aging effect requiring management. The absence of concrete aging effects is confirmed under Containment Inservice Inspection – IWL and Structures Monitoring Programs.

3. Cracks 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

   For Groups 1–3, 5–9 structures at GGNS, Category I structures, except the diesel generator building which is founded on compacted structural backfill, are founded on the Catahoula Formation. The Catahoula Formation of Miocene age consists primarily of hard-to-very-hard silty-to-sandy clay, clayey silt, and locally indurated or cemented clay, silt, and sand layers. The maximum settlement expected is less than one inch. This settlement is elastic and was determined to have occurred when the load was applied during initial construction. After construction was completed, onsite monitoring for potential settlement of Category I structures has been shown to be negligible. GGNS containment was not identified in IN 97-11 as a plant susceptible to erosion of porous concrete subfoundations. GGNS groundwater is not aggressive and there is no indication that groundwater chemistry has significantly changed and no changes in groundwater conditions have been observed. Potential total and differential settlements is addressed in the design of foundations at the site. A settlement monitoring program was established to monitor settlements of Category I structures during plant construction and thereafter. Therefore, cracks 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 is not an aging effect requiring management for GGNS concrete. Nonetheless, accessible concrete components will be monitored by the Structures Monitoring Program or the Containment Inservice Inspection – IWL Program to confirm the absence of aging effects.

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

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction to ensure concrete durability. GGNS structures are constructed of a dense, durable mixture of sound coarse aggregate, fine aggregate, cement, water, and admixture. These groups of structures at GGNS use a dense low permeable concrete with an acceptable water-to-cement ratio, which provides an acceptable degree of protection against aggressive chemical attack. Water chemical analysis results confirm that the site groundwater is considered to be non-aggressive.

   GGNS below-grade environment is not aggressive. Therefore, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation of below grade inaccessible concrete areas are not aging effects requiring management for GGNS Groups 1–5 and 7 –9 concrete structures. The absence of concrete aging effects is confirmed under Containment Inservice Inspection – IWL and Structures Monitoring Programs.

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. The temperatures shall not exceed 150°F except for local areas, which are allowed to have increased temperatures not to exceed 200°F. During normal operation, areas within containment are maintained below a bulk average temperature of 135ºF. The concrete in the cylinder wall for piping penetrations carrying hot fluid (pipe temperature > 200ºF), piping is insulated and cooling is provided to maintain the concrete temperature adjoining the embedded sleeve at or below 200ºF. For structures outside containment, concrete is not exposed to piping penetration temperatures in excess of 150°F.

GGNS concrete elements do not exceed the temperature limits associated with aging degradation due to elevated temperature. Therefore, reduction of strength and modulus of concrete due to elevated temperatures is not an aging effect requiring management.

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

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. GGNS 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 were within the limits provided in ACI 318. Therefore, loss of material (spalling, scaling) and cracking due to freeze thaw are not aging effects requiring management for GGNS Groups 6 structures. The absence of concrete aging effects is confirmed under Structures Monitoring and RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Programs.

2. Cracking Due to Expansion and Reaction with Aggregates in Below-Grade Inaccessible Concrete Areas of Group 6 Structures

   Aggregates were selected locally and were in accordance with specifications and materials conforming to ACI and ASTM standards at the time of construction. GGNS 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. GGNS below-grade environment is not 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 of Group 6 Structures is not an aging effect requiring management for GGNS concrete. The absence of concrete aging effects is confirmed under Structures Monitoring and RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Programs.

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

   Below-grade exterior reinforced concrete at GGNS is not exposed to an aggressive environment (pH less than 5.5), or to chloride or sulfate solutions beyond defined limits (greater than 500 ppm chloride, or greater than 1500 ppm sulfate). Therefore, increase in porosity and permeability, and loss of strength due to leaching of calcium hydroxide and carbonation in inaccessible areas of concrete elements are not aging effects requiring management for below-grade inaccessible concrete areas of GGNS Group 6 structures. The absence of concrete aging effects is confirmed under Structures Monitoring Program.

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 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

TLAA 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 GGNS 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 GGNS quality assurance procedures and administrative controls for aging management programs.

3.5.2.3 Time-Limited Aging Analyses

Potential TLAA identified for structural components and commodities include fatigue analyses for containment cylinder wall liner plate, suppression pool liner plate, cranes and penetration bellows. The fatigue analyses for the containment cylinder wall liner plate, suppression pool liner plate and penetration bellows were determined to be TLAA. These topics are discussed in Section 4.6.

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 Structure Monitoring 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 GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL (CII-IWL) Program. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion 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	Reduction of strength and modulus due to elevated temperature is not applicable to the containment structure. GGNS concrete in areas of this grouping are not exposed to temperatures that exceed the threshold. For further discussion see Section 3.5.2.2.1.2.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-4	Steel elements (inaccessible areas): drywell shell; drywell head; and drywell shell	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.	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWE and Containment Leak Rate Programs to verify the absence of other aging effects, such as loss of material, for components in this listing. For further discussion see Section 3.5.2.2.1.3 Item 1.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-5	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.	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWE and Containment Leak Rate Programs to verify the absence of other aging effects, such as loss of material, for components in this listing. For further discussion see Section 3.5.2.2.1.3 Item 1.
3.5.1-6	Steel elements: torus shell	Loss of material due to general, pitting and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	Yes, if corrosion is significant Recoating of the torus is recommended	Not applicable. GGNS is a Mark III containment and does not have a torus shell. For further discussion see Section 3.5.2.2.1.3 Item 2.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-7	Steel elements: torus ring girders; downcomers; Steel elements: suppression chamber shell (interior surface)	Loss of material due to general, pitting and crevice corrosion	ISI (IWE)	Yes, if corrosion is significant	Not applicable. NUREG-1801 items referencing this item are associated with Mark I and III containments with a torus and suppression chamber. GGNS is a Mark III containment with a concrete suppression pool with a steel liner. For further discussion see Section 3.5.2.2.1.3 Item 3.
3.5.1-8	Prestressing system; tendons	Loss of prestress due to relaxation, shrinkage, creep; elevated temperature	Yes, TLAA	Yes, TLAA	Not applicable. NUREG-1801 items referencing this item are associated with concrete containments. This is applicable only to PWR and BWR prestressed concrete containments. GGNS containment does not have prestress tendons. For further discussion 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 CLB fatigue analysis exists)	Yes, TLAA	Yes, TLAA	Fatigue analysis is TLAA for suppression pool and containment cylinder wall liner plate. The other listed element are applicable to Mark I containments. GGNS is a Mark III containment. For further discussion see Section 3.5.2.2.1.5.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-10	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	Cracking due to SCC is not an applicable aging mechanism for these primary containment components at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWE, Fatigue Monitoring, and Containment Leak Rate Programs to verify the absence of other aging effects, such as cracking, for components in this group listing. The Containment Inservice Inspection – IWE Program includes augmented exams to detect fine cracks. For further discussion 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	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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as loss of material, for components in this listing. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as loss of material, for components in this listing. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as cracking, for components in this listing.
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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-17	Concrete (accessible areas): dome; wall; basemat; ring girders; buttresses	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	ISI (IWL)	No	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as cracking, for components in this listing.
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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as cracking, for components in this listing.

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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as cracking, for components in this listing.
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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of other aging effects, such as cracking, for components in this listing.

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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of aging effects, such as cracking, for components in this listing.
3.5.1-22	Concrete (inaccessible areas): basemat; reinforcing steel	Cracking; loss of bond; and loss of material (spalling, scaling) due to corrosion of embedded steel	Structures Monitoring Program	No	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of other aging effects, such as loss of material and loss of bond, for components in this listing.

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	Consistent with NUREG-1801. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL and Structures Monitoring Programs to verify the absence of aging effects, such as cracking and loss of material, for components in this listing.
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	Consistent with NUREG-1801. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of aging effects, such as cracking and loss of material, for components in this listing.

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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWL Program to verify the absence of aging effects, such as cracking and loss of material, for components in this listing.
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 aging effects cited in the NUREG-1801 item are loss of sealing and leakage. Loss of sealing is a consequence of the aging effects cracking and change in material properties. GGNS does not have moisture barriers. Caulking, flashing and other sealants are managed by the Containment Inservice Inspection – IWE, Containment Leak Rate, Structures Monitoring, and Periodic Surveillance and Preventive Maintenance Programs for the listed components.

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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWE and Containment Leak Rate Programs to verify the absence of other aging effects, such as cracking, for components in this listing applicable to Mark III concrete containment.
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 Components manage loss of material for the listed components.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-29	Personnel airlock, equipment hatch, CRD hatch: locks, hinges, and closure mechanisms	Loss of leak tightness due to mechanical wear of locks, hinges and closure mechanisms	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Locks, hinges, and closure mechanisms are active components and are therefore not subject to aging management review. 10 CFR Part 50, Appendix J, and GGNS technical specifications require testing to ensure leak tightness of airlocks and hatches.
3.5.1-30	Pressure-retaining bolting	Loss of preload due to self-loosening	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, bolting components are included in the Containment Inservice Inspection – IWE and Containment Leak Rate Programs to verify the absence of other aging effects, such as loss of materials, for the listed components.
3.5.1-31	Pressure-retaining bolting, Steel elements: downcomer pipes	Loss of material due to general, pitting, and crevice corrosion	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. Listed aging effects do not require management at GGNS. GGNS 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	Not applicable. NUREG-1801 items referencing this item are associated with concrete containments. This is applicable only to PWR and BWR prestressed concrete containments. GGNS containment does not have prestress tendons.
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	The aging effects cited in the NUREG-1801 item are loss of sealing and leakage. Loss of sealing is a consequence of the aging effects cracking and change in material properties. Additionally the items referencing this item are associated with inside containment. GGNS items referring to seals and gaskets are associated with components outside containment and are managed by the Structures Monitoring Program for cracking and change in material properties.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-34	Service Level I coating	Loss of coating integrity due to blistering, cracking, flaking, peeling, or physical damage	Protective Coating and Maintenance Program	No	Consistent with NUREG-1801. The Protective Coating Monitoring and Maintenance Program manage loss of coating integrity for Service Level I coatings.

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 corrosion	Loss of material due to general, pitting, and crevice	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 loss of material for the listed components associated with GGNS containment. GGNS containment does not contain a drywell shell with sand pocket regions.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-36	Steel elements: drywell head; downcomers	Fretting or lockup due to mechanical wear	ISI (IWE)	No	Not applicable. Loss of material is the aging effect caused by mechanical wear. GGNS plant operating experience has not identified fretting or lock up due to mechanical wear for the drywell head. Downcomers are not common to GGNS Mark III containment. GGNS inspects the drywell head per the requirements of ASME Section XI. In addition, the drywell head is a stationary or fixed component and the special distance between connecting components makes it unlikely for fretting and lock up to occur.
3.5.1-37	Steel elements: suppression chamber (torus) liner (interior surface)	Loss of material due to general (steel only), 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 loss of material for the suppression pool liner. GGNS containment does not have a torus.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-38	Steel elements: suppression chamber shell (interior surface)	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. Listed aging effect does not require management at GGNS. Nonetheless, components are included in the Containment Inservice Inspection – IWE and Containment Leak Rate Program to verify the absence of other aging effects, such as loss of material, for components in this listing.
3.5.1-39	Steel elements: vent line bellows	Cracking due to stress corrosion cracking	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. Listed aging effect does not require management at GGNS. GGNS containment does not have vent line bellows.
3.5.1-40	Unbraced downcomers, Steel elements: vent header; downcomers	Cracking due to cyclic loading (CLB fatigue analysis does not exist)	ISI (IWE) and 10 CFR Part 50, Appendix J	No	Not applicable. Listed aging effect does not require management at GGNS. GGNS containment does not have the listed components.
3.5.1-41	Steel elements: drywell support skirt, Steel elements (inaccessible areas): support skirt	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
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	Not applicable. Listed aging effect does not require management at GGNS. GGNS concrete is air-entrained and designed in accordance with ACI -318. The design and construction of these groups of structures at GGNS 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. For further discussion see Section 3.5.2.2.2.1 Item 1

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-43	All Groups except Group 6:Concrete (inaccessible areas): all	Cracking due to expansion from reaction with aggregates	Further evaluation is required to determine if a plant-specific aging management program is needed.	Yes, if concrete is not constructed as stated	Consistent with NUREG-1801. The Structures Monitoring Program will manage the effects of cracking for components in this listing. For further discussion see Section 3.5.2.2.2.1 Item 2
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	Listed aging effects do not require management at GGNS. GGNS does not rely on a de-watering system to control settlement. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of aging effects, such as cracking, for components in this listing. For further discussion see Section 3.5.2.2.2.1 Item 3

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-45	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	Not applicable. Listed aging effects do not require management at GGNS. GGNS does not rely on a de-watering system to control settlement. Nonetheless, components are included in the Containment Inservice Inspection – IWL and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion see Section 3.5.2.2.2.1 Item 3

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-46	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	GGNS does not rely on a de-watering system to control settlement. Components are included in the Structures Monitoring Programs to verify the absence of aging effects, such as cracking, for components in this listing. For further discussion see Section 3.5.2.2.2.1 Item 3

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-47	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	Not applicable. Listed aging effects do not require management at GGNS. GGNS concrete is designed in accordance with ACI -318. The design and construction of these groups of structures at GGNS 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 the Containment Inservice Inspection – IWL and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion see Section 3.5.2.2.2.1 Item 4

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-48	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	Reduction of strength and modulus due to elevated temperature is not applicable to the containment structures. GGNS concrete in areas for this grouping are not exposed to temperatures that exceed the threshold. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants (RG 1.127) and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion see Section 3.5.2.2.2.3 Item 1

Table 3.5.1: Structures and Component Supports					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.5.1-50	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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in RG 1.127 and Structures Monitoring Programs to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion 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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of other aging effects, such as cracking, for components in this listing. For further discussion 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. For further discussion 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	Not applicable. No CLB fatigue analysis exists. For further discussion see Section 3.5.2.2.2.5
3.5.1-54	All groups except 6: concrete (accessible areas): all	Cracking due to expansion from reaction with aggregates	Structures Monitoring Program	No	Cracking due to expansion due to reaction with aggregates does not require aging management for concrete for these groups of structures at GGNS, because concrete is constructed in accordance with the recommendations in ACI 318. Nonetheless, components are included in 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
3.5.1-55	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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of other aging effects, such as cracking, for components in this listing.
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 Program manages loss of material for the components in this listing.

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	Not applicable. 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 and 3.5.1-92 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 Program manages the effects of aging for the components in this listing related to channels. GGNS does not have dams, reservoirs, canals or ponds subject to aging management.

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. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the RG 1.127 Program to verify the absence of aging effects, such as cracking and loss of material, for components in this listing. Loss of bond is included with cracking for the purpose of this review.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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	Not applicable. Aging effects are not significant for accessible and inaccessible areas. These concrete structures are exposed to saturated water conditions near the ground surface; however, the concrete used at GGNS is designed with entrained air content in conformance with ACI-318, and plant experience has not identified any degradation related to freeze-thaw. Nonetheless, the RG 1.127 Program will confirm the absence of aging effects requiring management for GGNS Group 6 concrete components.

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. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the RG 1.127 Program to verify the absence of other aging effects, such as cracking and loss of material, for components in this listing.
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 items referencing this item are associated with water-control structures. GGNS does not have components of wood in Group 6. However, GGNS does have similar components of wood consistent with this NUREG-1801 item managed by the Structures Monitoring Program for loss of material and change in material properties.

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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of other aging effects, such as cracking, for components in this listing.
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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of other aging effects, such as cracking, for components in this listing.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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. Listed aging effects are included in the Structures Monitoring Program to verify the absence of aging effects for components in this listing.
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. Listed aging effects are included in the Structures Monitoring Program to verify the absence of aging effects for components in this listing. Loss of bond is included with cracking for the purpose of this review.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-67	Groups 1-5, 7, 9: Concrete: interior; above-grade exterior, Groups 1-3, 5, 7-9 -concrete (inaccessible areas): below-grade exterior; foundation, Group 6: concrete (inaccessible areas): all	Increase in porosity and permeability; cracking; loss of material (spalling, scaling) due to aggressive chemical attack	Structures Monitoring Program	No	Consistent With NUREG-1801. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of aging effects, such as cracking, for components in this listing.
3.5.1-68	High-strength structural bolting	Cracking due to stress corrosion cracking	ISI (IWF)	No	Not applicable. Listed aging effects do not require management at GGNS. High strength bolts used in civil structures have not shown to be prone to SCC. Nonetheless, components are included in the Structures Monitoring and Inservice Inspection – IWF Programs to verify the absence of other aging effects, such as loss of material, for components in this listing.

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	Not applicable. Listed aging effects do not require management at GGNS. High strength bolts used in civil structures have not shown to be prone to SCC. Nonetheless, components are included in the Structures Monitoring Program to verify the absence of other aging effects, such as loss of material, for components in this listing.
3.5.1-70	Masonry walls: all	Cracking due to restraint shrinkage, creep, and aggressive environment	Masonry Wall	No	Consistent with NUREG-1801 for most masonry walls. The Masonry Wall Program manages this aging effect. In some cases the Fire Protection Program supplements the Masonry Wall Program. For fire barrier masonry walls outside the reactor building, the Fire Protection Program manages this aging effect by periodic inspections.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-71	Masonry walls: all	Loss of material (spalling, scaling) and cracking due to freeze-thaw	Masonry Wall	No	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Masonry Wall and Fire Protection Programs to verify the absence of other aging effects, such as loss of material, for components in this listing.
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	The aging effects cited in the NUREG-1801 item are loss of sealing due to deterioration of seals. Loss of sealing is a consequence of the aging effects cracking and change in material properties. Additionally the items referencing this item are associated with water-control structures. GGNS items referring to seals and gaskets are associated with structures other than water-control structures and are managed by the Structures Monitoring Program for cracking and change in material properties.

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 manage loss of coating integrity for Service Level I coatings.
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	Not applicable. Loss of mechanical function due to the listed mechanisms is not an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to corrosion are managed by the Structures Monitoring Program for component supports, such as Item 3.5.1-92, listed in this table.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-75	Sliding surfaces	Loss of mechanical function due to corrosion, distortion, dirt, debris, overload, wear	ISI (IWF)	No	Not applicable. Loss of mechanical function due to the listed mechanisms is not an aging effect. Such failures typically result from inadequate design or operating events rather than from the effects of aging. Failures due to corrosion are managed by the Inservice Inspection – IWF Program for component supports, such as Item 3.5.1-91, listed in this table.
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	Not applicable. this NUREG-1801 item is for BWR having a drywell with radial beam seats. GGNS is a Mark III 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 manage loss of material for the listed components.

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	At GGNS, the Water Chemistry Control – BWR Program manages aging effects on the spent fuel pool liner. Monitoring spent fuel pool water level in accordance with technical specifications and monitoring leakage from the leak test channels will also continue during the period of extended operation. Cracking due to stress corrosion is not an aging effect requiring management for treated water < 140°F. There are no stainless steel spent fuel components with intended functions exposed to treated water > 60°C (> 140°F).
3.5.1-79	Steel components: piles	Loss of material due to corrosion	Structures Monitoring Program	No	Not applicable. Listed aging effects do not require management at GGNS.
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 loss of material for the listed components.

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	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, bolting components are included in the Inservice Inspection – IWF to verify the absence of other aging effects, such as loss of material, for components in this listing.
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 loss of material for the components in this listing and also for other structural steel commodities.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 Program manages loss of material for the listed components.
3.5.1-84	Structural bolting	Loss of material due to pitting and crevice corrosion	“Water Chemistry,” for BWR water, and ISI (IWF)	No	Not applicable. Listed aging effects do not require management at GGNS. Nonetheless, components are included in the Inservice Inspection – IWF Program to verify the absence of other aging effects, such as loss of material, for components in this listing.
3.5.1-85	Structural bolting	Loss of material due to pitting and crevice corrosion	“Water Chemistry,” for BWR water, and ISI (IWF)	No	Not applicable. Listed aging effects do not require management at GGNS.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.5.1-86	Structural bolting	Loss of material due to pitting and crevice corrosion	ISI (IWF)	No	Not applicable. Listed aging effects do not require management at GGNS.
3.5.1-87	Structural bolting	Loss of preload due to self-loosening	ISI (IWF)	No	Not applicable. Listed aging effects do not require management at GGNS.
3.5.1-88	Structural bolting	Loss of preload due to self-loosening	Structures Monitoring Program	No	Not applicable. Listed aging effects do not require management at GGNS.
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	Not applicable. Boric acid corrosion is specific to PWR plants. GGNS is a BWR.
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	Consistent with NUREG-1801. The Water Chemistry Control – BWR and Inservice Inspection – IWF Programs manage loss of material for the listed components.
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 will manage loss of material for the listed components.

Table 3.5.1: Structures and Component Supports

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
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 will manage loss of material for the listed components.
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 will manage loss of material for the listed components.
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	Not applicable. No vibration isolation elements at GGNS are in scope and subject to aging management review.
3.5.1-95	Support members; welds; bolted connections; support anchorage to building structure exposed to Air - indoor, uncontrolled	None	None	NA - No AEM or AMP	Consistent with NUREG-1801.

Notes for Table 3.5.2-1 through Table 3.5.2-4

Generic Notes

A. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP is consistent with NUREG-1801 AMP description.

B. Consistent with component, material, environment, aging effect and aging management program listed for NUREG-1801 line item. AMP takes some exceptions to NUREG-1801 AMP description.

C. Component is different, but consistent with material, environment, aging effect, and aging management program 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 for NUREG-1801 line item. AMP takes some exceptions to NUREG-1801 AMP description.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

F. Material not in NUREG-1801 for this component.

G. Environment not in NUREG-1801 for this component and material.

H. Aging effect not in NUREG-1801 for this component, material and environment combination.

I. Aging effect in NUREG-1801 for this component, material and environment combination is not applicable.

J. Neither the component nor the material and environment combination is evaluated in NUREG-1801.

Plant-Specific Notes

501. The GGNS environment is not conducive to the listed aging effects. However, the identified AMP will be used to confirm the absence of significant aging effects for the period of extended operation.

502. 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, that are protected from weather 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 GGNS.

503. Vapors of sulfur dioxide or other similar substances do not chemically pollute the ambient outdoor environment at GGNS and the external environment does not contain saltwater or high chloride content. Therefore aging management is not required for aluminum and stainless steel components exposed to the external environment.

504. The One-Time Inspection Program will verify the effectiveness of the Water Chemistry Control – BWR Program.

Table 3.5.2-1
Containment Building
Summary of Aging Management Evaluation

Table 3.5.2-1: Containment 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**
Auxiliary platform equipment assembly and rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII B.A-07	3.3.1-52	A
Containment cylinder wall liner plate	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B3.2.CP-35	3.5.1-35	A
Containment cylinder wall liner plate	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Cracking	TLAA – metal fatigue	II.B2.2.C-48	3.5.1-9	A
Containment cylinder wall mechanical penetrations	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of Material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-35	A
Containment cylinder wall mechanical penetrations	PB, SSR	Stainless steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-35	A
Containment cylinder wall electrical penetrations	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-35	A

Table 3.5.2-1: Containment 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 equipment hatch	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.C-16	3.5.1-28	B
Containment hatchway crane-crane rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII B.A-07	3.3.1-52	A
Containment hatchway crane structural girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII B.A-07	3.3.1-52	A
Containment personnel lock	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.C-16ct	3.5.1-28	B
Containment sumps liner and penetrations	EN, PB, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Containment sump liner and penetrations	EN, PB, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3.TP-8	3.5.1-95	C
Drywell electrical penetrations	EN, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-35	A

Table 3.5.2-1: Containment 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
Drywell equipment hatch	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.C-16	3.5.1-28	B
Drywell head	EN, MB, PB, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Drywell head	EN, MB, PB, SSR	Stainless steel	Exposed to fluid environment	Loss of material	CII – IWE Containment Leak Rate	II.B2.2.C-49	3.5.1-37	B
Drywell head access manway	EN, MB, PB, SSR	Stainless steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.C-16	3.5.1-28	B
Drywell liner plate	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B2.2.C-49	3.5.1-37	B
Drywell liner plate	EN, MB, PB, SSR	Stainless steel	Exposed to fluid environment	Loss of material	CII – IWE Containment Leak Rate	II.B2.2.C-49	3.5.1-37	B
Drywell mechanical penetrations	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-35	A
Drywell personnel access lock	EN, MB, PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.C-16	3.5.1-28	B

Table 3.5.2-1: Containment 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
Fuel transfer tube penetration	PB, SSR	Stainless steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-28	B
Fuel transfer tube penetration	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-28	B
Guard piping	EN, MB, PB	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B4.CP-36	3.5.1-28	B
Metal siding	EN, PB	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Metal siding	EN, PB	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4.TP-6	3.5.1-93	C
Monorails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302	3.5.1-77	E
Penetration bellows	PB, SSR	Stainless steel	Air – indoor uncontrolled	Cracking	TLAA – metal fatigue	II.B4.C-13	3.5.1-9	A
Penetration bellows	PB, SSR	Stainless steel	Air – indoor uncontrolled	Cracking	CII – IWE Containment Leak Rate	II.B4.CP-38	3.5.1-10	A

Table 3.5.2-1: Containment 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
Personnel airlock, equipment hatch and drywell head bolting	PB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B1.1.CP-43	3.5.1-35	A
Polar crane- rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII B.A-07	3.3.1-52	A
Polar crane- structural girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII B.A-07	3.3.1-52	A
Quencher support	SSR	Carbon steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI – IWF	II.B2.2.CP-117	3.5.1-31	E
Reactor shield wall (steel portion)	EN, MB, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B5.TP-43	3.5.1-92	A
Reactor vessel support (ring girder)	SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24	3.5.1-91	A
Refueling Platform equipment assembly- rails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Refueling Platform equipment assembly- structural steel	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A

Table 3.5.2-1: Containment 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**
Refueling pool gate	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 504
Refueling pool liner plate	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR	VII.A4.AP-110	3.3.1-25	C, 504
Roof decking	EN, PB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
RPV cavity liner	EN, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3.TP-8	3.5.1-95	C
RPV pedestal sump liner and penetrations	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A7.T-23	3.5.1-52	E
Structural steel: beams, columns and plates	EN, MB, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302	3.5.1-77	C
Suppression pool liner plate	EN, HS, PB, SSR	Stainless steel	Air – indoor uncontrolled	Loss of material	CII – IWE Containment Leak Rate	II.B2.2.C-49	3.5.1-37	A
Suppression pool liner plate	EN, HS, PB, SSR	Stainless steel	Exposed to fluid environment	Loss of material	CII – IWE Containment Leak Rate	II.B2.2.C-49	3.5.1-37	B
Suppression pool liner plate	EN, HS, PB, SSR	Stainless steel	Exposed to fluid environment	Cracking	TLAA – metal fatigue	II.B2.2.C-48	3.5.1-9	A

Table 3.5.2-1: Containment 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
Upper containment pool liner plate and gate	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR	III.A7.T-23	3.5.1-52	E
Upper containment pool spent fuel storage racks	SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR	III.A7.T-23	3.5.1-52	E
Weir wall liner plate	HS, SSR	Stainless steel	Exposed to fluid environment	Loss of material	CII – IWE	II.B2.2.C-49	3.5.1-37	E
Beams, columns, floor slabs and interior walls	EN, FLB, MB, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	II.B3.2.CP-84	3.5.1-24	I, 501
Containment base slab/foundation	FLB, PB, SRE,SSR	Concrete	Air – indoor uncontrolled	None	CII – IWL	II.B3.2.CP-89	3.5.1-23	I, 501
Containment foundation	FLB, PB, SRE,SSR	Concrete	Soil	None	CII – IWL	II.B3.2.CP-105	3.5.1-1	I, 501
Containment cylinder wall and dome	EN, FLB, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking	CII – IWL	II.B3.2.CP-89	3.5.1-23	A
Containment sump structures	SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A1.TP-25	3.5.1-54	I, 501
Drywell floor slab	EN, SSR	Concrete	Exposed to fluid environment	None	Structures Monitoring	II.B3.2.CP-84	3.5.1-24	I, 501

Table 3.5.2-1: Containment 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
Drywell wall	SSR, EN, MB, PB	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	II.B3.2.CP-84	3.5.1-24	I, 501
Main steam pipe tunnel	MB, PB, SNS, SSR	Concrete	Air – outdoor	None	Structures Monitoring	II.B3.2.CP-89	3.5.1-23	I, 501
Masonry walls	EN, MB, SNS, SSR,	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A1.T-12	3.5.1-70	A
Reactor pedestal	SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	II.B3.2.CP-84	3.5.1-24	I, 501
Upper containment pool floor and walls	EN, MB, SNS, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A1.TP-25	3.5.1-54	I, 501
Containment building electrical penetration seals and sealant	PB, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Containment Leak Rate	II.B4.CP-40	3.5.1-26	E
Moisture barrier	EN, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Structures Monitoring	II.B4.CP-40	3.5.1-26	E
Rubber seal for airlock doors, equipment hatch	PB, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	CII – IWE Containment Leak Rate	II B4.CP-40	3.5.1-26	B

Table 3.5.2-1: Containment 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
Service Level I coatings	SNS	Coatings	Air – indoor uncontrolled	Loss of coating integrity	Protective Coating Monitoring and Maintenance	II.B4.CP-152	3.5.1-34	A
Service Level I coatings	SNS	Coatings	Air – indoor uncontrolled	Loss of coating integrity	Protective Coating Monitoring and Maintenance	III.A4.TP-301	3.5.1-73	A
Upper containment pool gates rubber gasket/seal	EN	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Periodic Surveillance and Preventive Maintenance	II B4.CP-40	3.5.1-26	E

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**
Basin debris screen and grating	EN, SSR	Stainless Steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A8.T-23	3.5.1-52	E
Cooling Tower Fill	HS, SNS	Stainless Steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A8.T-23	3.5.1-52	E
Culvert No. 1	SNS	Galvanized steel	Exposed to fluid environment	Loss of material	RG 1.127	III.A6.T-22	3.5.1-58	C
Fan Stack Grating	EN, HS, MB, SNS	Stainless Steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A8.T-23	3.5.1-52	E
Monorail	SNS	Carbon Steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A6.TP-248	3.5.1-80	C
Structural steel, beams columns, and plates	EN, HS, SNS, SSR	Galvanized steel	Exposed to fluid environment	Loss of material	Structures Monitoring	--	--	J
Beams, and columns	EN, HS, SNS, SSR	Concrete	Exposed to fluid environment	None	RG 1.127	III.A6.TP-37	3.5.1-61	I, 501
Culvert No. 1	SNS	Concrete	Exposed to fluid environment	Cracking	Structures Monitoring	III.A6.TP-31	3.5.1-46	A
Exterior walls above grade	EN, HS, MB, SNS, SSR	Concrete	Air – outdoor	Cracking	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
Exterior walls (below grade)	EN, HS, SNS, SSR	Concrete	Soil	Cracking	Structures Monitoring	III.A6.TP-104	3.5.1-65	A
Floor slab	EN, HS, MB, SNS, SSR	Concrete	Air – indoor uncontrolled	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Floor slab	EN, HS, MB, SNS, SSR	Concrete	Exposed to fluid environment	None	RG 1.127	III.A6.TP-37	3.5.1-61	I, 501
Foundation	EN, HS, SNS, SSR	Concrete	Exposed to fluid environment	None	RG 1.127	III.A6.TP-37	3.5.1-61	I, 501
Foundation	EN, HS, SNS, SSR	Concrete	Soil	None	Structures Monitoring	III.A6.TP-104	3.5.1-65	I, 501
Interior walls	EN, HS, MB, SNS, SSR	Concrete	Air – indoor uncontrolled	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Interior walls	EN, HS, MB, SNS, SSR	Concrete	Exposed to fluid environment	None	RG 1.127	III.A6.TP-37	3.5.1-61	I, 501
Masonry walls	EN, MB, SNS, SSR	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A6-T-12	3.5.1-70	A
Roof hatches	EN, MB, SNS, SSR	Concrete	Air – indoor uncontrolled	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501

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
Roof hatches	EN, MB, SNS, SSR	Concrete	Air – outdoor	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Roof slabs	EN, MB, SNS, SSR	Concrete	Air – indoor uncontrolled	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Roof slabs	EN, MB, SNS, SSR	Concrete	Air – outdoor	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Cooling tower drift eliminators	HS, SNS	Fiber reinforced polyester	Exposed to fluid environment	Cracking	Structures Monitoring	--	--	J
Cooling tower fill	HS, SNS	Ceramic tile	Exposed to fluid environment	None	Structures Monitoring	--	--	J
Drainage channel	SNS	Rock/stone/ soil	Exposed to fluid environment	Loss of form	RG 1.127	III.A6.T-22	3.5.1-58	A

Table 3.5.2-3
Turbine Building, Process Facilities, and Yard Structures
Summary of Aging Management Evaluation

Table 3.5.2-3: Turbine Building, Process Facilities, and Yard 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
Control room ceiling support system	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302	3.5.1-77	C
Cranes: rail	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Cranes: structural girders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Inspection of OVHLL	VII.B.A-07	3.3.1-52	A
Metal siding	SRE	Galvanized steel	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	A
Metal siding	SRE	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4.TP-6	3.5.1-93	A
Monorails	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	C
New fuel storage racks	EN, SSR	Aluminum	Air – indoor uncontrolled	None	None	III.B4.TP-8	3.5.1-95	A
Pressure relief panels	SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	C
Pressure relief panels	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	C

Table 3.5.2-3: Turbine Building, Process Facilities, and Yard 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 decking	SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A3.TP-302	3.5.1-77	A
Roof decking	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	C
Spent fuel pool liner plate and gate	EN, SSR	Stainless steel	Exposed to fluid environment	Cracking	Water Chemistry Control – BWR and monitoring of spent fuel pool water level	III.A5.T-14	3.5.1-78	A, 504
Spent fuel storage racks	EN, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR and monitoring of spent fuel pool water level	III.A5.T-14	3.5.1-78	A, 504
Structural steel: beams, columns, plates	EN, MB, SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A5.TP-302	3.5.1-77	A
Structural steel: beams, columns, plates	EN, MB, SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302 III.A5.TP-302	3.5.1-77	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	E
Transmission towers	SRE	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B4.TP-6	3.5.1-93	C

Table 3.5.2-3: Turbine Building, Process Facilities, and Yard 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	Cracking	Structures Monitoring	III.A1.TP-26	3.5.1-66	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	I, 501
CST/RWST retaining basin (wall)	EN, SNS	Concrete	Air – outdoor	None	Structures Monitoring	III.A3.TP-204	3.5.1-43	I, 501
CST/RWST retaining basin (wall)	EN, SNS	Concrete	Soil	None	Structures Monitoring	III.A3.TP-27	3.5.1-65	I, 501
Diesel fuel tank access tunnel slab	EN, MB, SSR	Concrete	Air – outdoor	None	Structures Monitoring	III.A3.TP-204	3.5.1-43	I, 501
Duct banks	EN, SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring	III.A3.TP-27	3.5.1-65	I, 501
Exterior walls	EN, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	Cracking	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A5.TP-26	3.5.1-66	A
Exterior walls	EN, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	Cracking	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A5.TP-26	3.5.1-66	A

Table 3.5.2-3: Turbine Building, Process Facilities, and Yard 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 walls	FB	Concrete	Air – outdoor	Cracking	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	I, 501
Exterior walls	FB	Concrete	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	I, 501
Exterior walls (below grade)	EN, MB, FLB, PB, SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring	III.A1.TP-27 III.A3.TP-27 III.A5.TP-27	3.5.1-65	I, 501
Foundations (buildings, transformers, tanks, circuit breakers)	EN, SRE, SSR	Concrete	Soil	None	Structures Monitoring	III.A1.TP-27 III.A3.TP-27 III.A5.TP-27	3.5.1-65	I, 501
Manholes	EN, SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring	III.A3.TP-27	3.5.1-65	I, 501
Masonry walls	EN, SNS, SRE, SSR	Concrete block	Air – indoor uncontrolled	Cracking	Masonry Wall	III.A1.T-12 III.A3.T-12	3.5.1-70	A
Masonry walls	EN, SNS, SRE, SSR	Concrete block	Air – outdoor	Cracking	Masonry Wall	III.A1.T-12 III.A3.T-12	3.5.1-70	A

Table 3.5.2-3: Turbine Building, Process Facilities, and Yard 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
Masonry walls	FB	Concrete block	Air – indoor uncontrolled	Cracking	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	C
Masonry walls	FB	Concrete block	Air – outdoor	Cracking	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	C
Roof slabs	EN, MB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A5.TP-26	3.5.1-66	I, 501
Roof slabs	EN, MB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A1.TP-26 III.A3.TP-26 III.A5.TP-26	3.5.1-66	I, 501
Roof slabs	FB	Concrete	Air – indoor uncontrolled	None	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	I, 501
Roof slabs	FB	Concrete	Air – outdoor	None	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	I, 501
Sumps	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A7.TP-28	3.5.1-67	I, 501
Sumps	SNS, SRE, SSR	Concrete	Soil	None	Structures Monitoring	III.A7.TP-30	3.5.1-44	I, 501

Table 3.5.2-3: Turbine Building, Process Facilities, and Yard 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
Wooden utility poles	SRE	Treated wood	Air – outdoor	Loss of material Change in material properties	Structures Monitoring	III.A6.TP-223	3.5.1-62	E
Wooden utility poles	SRE	Treated wood	Soil	Loss of material Change in material properties	Structures Monitoring	III.A6.TP-223	3.5.1-62	E
Wooden utility towers	SRE	Treated wood	Air – outdoor	Loss of material Change in material properties	Structures Monitoring	III.A6.TP-223	3.5.1-62	E
Wooden utility towers	SRE	Treated wood	Soil	Loss of material Change in material properties	Structures Monitoring	III.A6.TP-223	3.5.1-62	E

Table 3.5.2-4
Bulk Commodities
Summary of Aging Management Evaluation

Table 3.5.2-4: Bulk Commodities

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	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
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	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
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Anchorage / embedments	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI – IWF	III.B1.1.TP-10	3.5.1-90	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
Anchorage / embedments	SNS, SRE, SSR	Stainless steel	Exposed to fluid environment	Loss of material	Water Chemistry Control – BWR ISI – IWF	III.B1.1.TP-10	3.5.1-90	A
Base plates	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	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
Base plates	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Base plates	SNS, SRE, SSR	Carbon steel	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
Base plates	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Base plates	SNS, SRE, SSR	Stainless steel	Air – outdoor	None	None	--	--	I, 503
Battery racks	SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B3.TP-43	3.5.1-92	C
Cable tray	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	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
Cable tray	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Cable trays support	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	A
Cable trays support	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Component and piping supports for ASME Class 1, 2, 3 and MC	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B1.3.TP-8	3.5.1-95	A
Component and piping supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	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
Component and piping supports	SNS, SRE, SSR	Carbon steel	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
Component and piping supports	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
Component and piping supports	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Component and piping supports	SNS, SRE, SSR	Stainless steel	Air – indoor uncontrolled	None	None	III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	A
Component and piping supports	SNS, SRE, SSR	Stainless steel	Air – outdoor	None	None	--	--	I, 503
Component and piping supports	SNS, SRE, SSR	Carbon steel	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Conduits	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Conduits	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	A
Conduit supports	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	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
Conduit supports	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6	3.5.1-93	A
Conduit supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	A
Conduit supports	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	A
Damper framing	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B3.TP-43	3.5.1-92	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.B3.TP-43	3.5.1-92	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B3.TP-8	3.5.1-95	C
Electrical and instrument panels and enclosures	SNS, SRE, SSR	Galvanized steel	Air – outdoor	Loss of material	Structures Monitoring	III.B3.TP-274	3.5.1-82	C
Fire doors	FB	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Protection	VII.G.AP-150	3.3.1-58	C
Fire doors	FB	Carbon steel	Air – outdoor	Loss of material	Fire Protection	--	--	H

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 hose reels	SRE	Carbon steel	Air – indoor uncontrolled	Loss of material	Fire Water System	III.B2.TP-43	3.5.1-92	E
Flood, pressure and specialty doors	EN, FLB, MB, PB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A2.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302	3.5.1-77	C
Flood, pressure and specialty doors	EN, FLB, MB, PB	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A2.TP-302 III.A3.TP-302	3.5.1-77	C
HVAC duct supports	SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	A
HVAC duct supports	SNS, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Instrument line supports	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	A
Instrument line supports	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B3.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
Instrument racks, frames and tubing trays	SNS, SRE, SSR	Galvanized steel	Air – indoor uncontrolled	None	None	III.B2.TP-8	3.5.1-95	A
Manways, hatches, manhole covers, and hatch covers	EN, FLB, MB, PB, SRE, SSR, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A7.TP-302	3.5.1-77	C
Manways, hatches, manhole covers, and hatch covers	EN, FLB, MB, PB, SRE, SSR, SNS	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A7.TP-302	3.5.1-77	C
Mirror insulation	INS, SNS	Stainless steel	Air – indoor uncontrolled	None	None	III.B1.3.TP-8	3.5.1-95	C
Missile shields	EN, MB	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A7.TP-302	3.5.1-77	A
Penetration sleeves (mechanical/ electrical not penetrating primary containment boundary)	FLB, SSR, SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2.TP-43	3.5.1-92	C
Pipe whip restraints	SSR, SNS, EN	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	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
Stairway, handrail, platform, grating, decking, and ladders	SNS	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A2.TP-302 III.A3.TP-302 III.A4.TP-302 III.A5.TP-302 III.A7.TP-302 III.A8.TP-302	3.5.1-77	A
Stairway, handrail, platform, grating, decking, and ladders	SNS	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	A
Support members: welds; bolted connections; support anchorages to building structure	EN, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.B2.TP-43 III.B3.TP-43 III.B4.TP-43 III.B5.TP-43	3.5.1-92	A
Support members: welds; bolted connections; support anchorages to building structure	EN, SNS, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Vents and louvers	SNS, SRE, SSR	Carbon steel	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-302 III.A2. 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
Vents and louvers	SNS, SRE, SSR	Carbon steel	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-302 III.A3.TP-302	3.5.1-77	C
Vents and louvers	SNS, SRE, SSR	Aluminum	Air – outdoor	None	None	--	--	I, 503
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	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
Anchor bolts	SNS, SRE, SSR	Carbon steel (bolted connections)	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
Anchor bolts	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B1.3.TP-8 III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	A
Anchor bolts	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – outdoor	None	None	--	--	I, 503
Anchor bolts	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B1.3.TP-8 III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	A
Anchor bolts	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.B2.TP-6 III.B4.TP-6	3.5.1-93	A
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.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**
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	ISI – IWF	III.B1.1.T-24 III.B1.2.T-24 III.B1.3.T-24	3.5.1-91	A
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B1.3.TP-8	3.5.1-95	A
ASME Class 1, 2, 3 and MC Supports bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – outdoor	None	None	--	--	I, 503
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – indoor uncontrolled	Loss of material	Structures Monitoring	III.A1.TP-248 III.A2.TP-248 III.A3.TP-248 III.A4.TP-248 III.A5.TP-248 III.A6.TP-248 III.A7.TP-248 III.A8.TP-248 III.A9.TP-248 III.B2.TP-248 III.B3.TP-248 III.B4.TP-248 III.B5.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
Structural bolting	SNS, SRE, SSR	Carbon steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A2.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274 III.A7.TP-274 III.A8.TP-274 III.A9.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 (bolted connections)	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.TP-221	3.5.1-83	E
Structural bolting	SNS, SRE, SSR	Galvanized steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	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	Galvanized steel (bolted connections)	Air – outdoor	Loss of material	Structures Monitoring	III.A1.TP-274 III.A2.TP-274 III.A3.TP-274 III.A4.TP-274 III.A5.TP-274 III.A7.TP-274 III.A8.TP-274 III.A9.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	Stainless steel (bolted connections)	Air – indoor uncontrolled	None	None	III.B1.1.TP-8 III.B1.2.TP-8 III.B1.3.TP-8 III.B2.TP-8 III.B3.TP-8 III.B4.TP-8 III.B5.TP-8	3.5.1-95	A
Structural bolting	SNS, SRE, SSR	Stainless steel (bolted connections)	Air – outdoor	None	None	--	--	I, 503

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	None	Structures Monitoring	III.A1.TP-25 III.A2.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25 III.A7.TP-25	3.5.1-54	I, 501
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring	III.A1.TP-25 III.A2.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25 III.A7.TP-25	3.5.1-54	I, 501
Equipment pads/ foundations	SNS, SRE, SSR	Concrete	Air – outdoor	None	RG 1.127	III.A6.TP-38	3.5.1-59	I, 501
Fire Proofing	FB	Pyrocrete	Air – indoor uncontrolled	None	Fire Protection Structures Monitoring	--	--	J, 501
Flood curbs	FLB, SNS, SRE	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A3.TP-25 III.A5.TP-25	3.5.1-54	I, 501
Flood curbs	FB	Concrete	Air – indoor uncontrolled	None	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	I, 501

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	FLB, PB, SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A1.TP-25 III.A2.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25 III.A7.TP-25 III.A8.TP-25	3.5.1-54	I, 501
Manways, hatches, manhole covers, and hatch covers	FB	Concrete	Air – indoor uncontrolled	None	Fire Protection Structures Monitoring	VII.G.A-90	3.3.1-60	I, 501
Manways, hatches, manhole covers, and hatch covers	FB	Concrete	Air – outdoor	None	Fire Protection Structures Monitoring	VII.G.A-92	3.3.1-61	I, 501
Manways, hatches, manhole covers, and hatch covers	FLB, PB, SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring	III.A3.TP-26	3.5.1-66	I, 501
Missile shields	MB	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A7.TP-26	3.5.1-66	I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Air – indoor uncontrolled	None	Structures Monitoring	III.A1.TP-25 III.A2.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25	3.5.1-54	I, 501

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	SNS, SRE, SSR	Concrete	Air – outdoor	None	Structures Monitoring	III.A1.TP-25 III.A2.TP-25 III.A3.TP-25 III.A4.TP-25 III.A5.TP-25	3.5.1-54	I, 501
Support pedestals	SNS, SRE, SSR	Concrete	Exposed to fluid environment	Loss of material	Structures Monitoring	III.A6.T-20	3.5.1-56	E
Fire stops	FB	Cera blanket, elastomers	Air – indoor uncontrolled	Cracking/ delamination separation	Fire Protection	--	--	J
Fire wrap	FB	Cerafiber, cera blanket	Air – indoor uncontrolled	Loss of material	Fire Protection	--	--	J
Flood retention materials (spare parts)	FLB	Wood, sand bags, sealant	Air – indoor uncontrolled	None	Structures Monitoring	--	--	I, 501
Insulation	INS, SNS	Fiberglass/ calcium silicate	Air – indoor uncontrolled	None	None	--	--	J, 501
Penetration sealant (fire)	EN,FB, PB, SNS	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Fire Protection	VII G.A-19	3.5.1-57	B

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 sealant (flood, radiation)	EN,FLB, PB, SNS	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Roof membrane	EN, SNS	Elastomer	Air – outdoor	Cracking Change in material properties	Structures Monitoring	II.B4.CP-41	3.5.1-33	E
Seals and gaskets (doors, manways and hatches)	FLB, PB, SSR,	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Structures Monitoring	II.B4.CP-41	3.5.1-33	E
Seals and gaskets (doors, manways and hatches)	FLB, PB, SSR,	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Structures Monitoring	III.A6.TP-7	3.5.1-72	A
Seismic isolation joint	FB, SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	Fire Protection	VII.G.A-19	3.3.1-57	D
Seismic isolation joint	SSR	Elastomer	Air – indoor uncontrolled	Cracking Change in material properties	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
Service Level I coatings	SNS	Coatings	Air – indoor uncontrolled	Loss of coating integrity	Protective Coating Monitoring and Maintenance	II.B4.CP-152	3.5.1-34	A
Water stops	FLB	Rubber	Air – indoor uncontrolled	None	None	--	--	J
Water stops	FLB	Galvanized steel	Air – indoor uncontrolled	None	None	III.B5.TP-8	3.5.1-95	C

3.6 ELECTRICAL AND INSTRUMENTATION AND CONTROLS

3.6.1 Introduction

This section provides the results of the aging management review for electrical components which 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
  - EIC 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 (400V to 35kV) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements
  - Inaccessible power (115kV) cables (e.g., installed underground in conduit, duct bank or direct buried) not subject to 10 CFR 50.49 EQ requirements
- 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 programs evaluated in NUREG-1801 for the electrical and I&C components. This table uses the format described in the introduction to Section 3. Hyperlinks are provided to the program evaluations in Appendix B.

3.6.2 Results

Table 3.6.2-1, Electrical and I&C (EIC) 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, Environment, Aging Effects Requiring Management, and Aging Management Programs

The following sections list the materials, environments, aging effects requiring management, and aging management programs for electrical and I&C components subject to aging management review. Programs are described in Appendix B. Further details are provided in Table 3.6.2-1.

Materials

Electrical and I&C components subject to aging management review are constructed of the following materials.

- aluminum
- cement
- galvanized metals
- insulation material (various organic polymers)
- porcelain
- steel and steel alloys
- various metals used for electrical connections

Environment

Electrical and I&C components subject to aging management review are exposed to the following environments.

- air – indoor controlled
- air – indoor uncontrolled
- air – outdoor
- heat and air
- moisture and air
- radiation and air
- significant moisture

Aging Effects Requiring Management

The following aging effects associated with electrical and I&C components require management.

- increased resistance of connection
- reduced insulation resistance (IR)

Aging Management Programs

The following aging management programs will manage the effects of aging on electrical and I&C components.

- Non-EQ Cable Connections
- Non-EQ Inaccessible Power Cables (400 V to 35 kV)
- Program Description
- Non-EQ Insulated Cables and Connections
- Non-EQ Instrumentation Circuits Test Review

3.6.2.2 Further Evaluation of Aging Management as Recommended by NUREG-1800

NUREG-1800 indicates that further evaluation is necessary for certain aging effects and other issues. Section 3.6.2.2 of NUREG-1800 discusses these aging effects and other issues that require further evaluation. The following sections, numbered corresponding to the discussions in NUREG-1800, explain the GGNS 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 GGNS 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. GGNS 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 GGNS.

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 GGNS 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 GGNS, transmission conductors from the GGNS 115 kV switchyard to the engineered safety features transformer (ESF 12) and from the GGNS 115 kV switchyard to the Port Gibson substation 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 GGNS, switchyard bus from the 115 kV switchyard breakers to the 115 kV transmission conductors, and from the 115 kV transmission conductors to the transformer yard (ESF 12) support recovery from an SBO. At GGNS, switchyard bus from the 34.5 kV switchyard breakers to the inaccessible medium-voltage cables and from the inaccessible medium-voltage cables to the transformer yard (ESF 11 and ESF 21) support recovery from an SBO. Other switchyard bus does not require aging management review since it does not perform a license renewal intended function.

Loss of Conductor Strength (Corrosion)

The most prevalent mechanism contributing to loss of conductor strength of an aluminum conductor steel reinforced (ACSR) transmission conductor is corrosion, which includes corrosion of the steel core and aluminum strand pitting. For ACSR conductors, degradation begins as a loss of zinc from the galvanized steel core wires.

Corrosion in ACSR conductors is a very slow-acting aging mechanism with the corrosion rates depending largely on air quality. Air quality factors include suspended particle chemistry, sulfur dioxide (SO2) concentration, and meteorological conditions. Air quality in rural areas, such as the area surrounding GGNS, generally contains low concentrations of suspended particles and SO2, which minimizes the corrosion rate. There are no industries in the immediate area where GGNS is located, so this is a considered a typical rural area. Tests performed by Ontario Hydro showed a 30% loss of composite conductor strength of an 80 year old ACSR conductor due to corrosion.

GGNS ESF 12 transformer high-voltage side is connected to the 115 kV switchyard via overhead transmission lines. The 115kV switchyard is connected to the Port Gibson substation via overhead transmission lines. These 115 kV overhead transmission conductors are 336.4 thousand circular mils (MCM) 26/7 ACSR (Linnet) conductors. This specific conductor construction type was included in the Ontario Hydroelectric test, so the results of this test are representative of the GGNS 115kV overhead transmission conductors. The 336.4 MCM 26/7 ACSR transmission conductor tested in the Ontario Hydro test, as documented in the companion paper, "Aged ACSR Conductors, Part II - Prediction of Remaining Life," bounds the GGNS transmission conductors.

There is a percentage of composite conductor strength established at which a transmission conductor is replaced. As illustrated below, there is ample strength margin to maintain the transmission conductor intended function through the period of extended operation.

The National Electrical Safety Code (NESC) requires that tension on installed conductors be less than 60% of the ultimate conductor strength. The NESC also specifies the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind and temperature. These requirements were reviewed for the specific transmission conductors included in the scope of license renewal. Evaluation of the conductor type with the smallest ultimate strength margin (4/0 ACSR, 6/1) in the NESC illustrates the conservative nature of the design of transmission conductors. The 4/0 ACSR 6/1 conductor has only one steel reinforcement conductor, so the impacts of corrosion on this one steel reinforcement conductor is more severe than a transmission conductor with multiple steel reinforcement conductors.

The ultimate strength and the NESC required heavy load tension capability of 4/0 (212 MCM) ACSR 6/1 are 8350 lbs. and 2761 lbs. respectively. Based on the NESC criteria, a 4/0 ACSR 6/1 conductor could have an installed tension of 5010 lbs. (60% of 8350 lbs.), which is a margin of 3340 lbs., i.e., there would be a 40% of ultimate strength margin for a new cable. The actual margin for a 4/0 ACSR 6/1 conductor between the NESC heavy load and the ultimate strength is 5589 lb.; i.e., there is a 67% of ultimate strength margin. The Ontario Hydro study showed a 30% loss of composite conductor strength in an 80-year-old conductor. In the case of the 4/0 ACSR 6/1 transmission conductors, a 30% loss of ultimate strength would mean that the 80 year ultimate strength (30% loss) of 4/0 (212 MCM) ACSR 6/1 would be 5845 lbs. Based on the NESC criteria, an 80-year-old 4/0 ACSR 6/1 conductor could have an installed tension of 3507 lbs. (60% of 5845 lbs.), which is a margin of 746 lbs., i.e., there would be a 13% of ultimate strength margin for an 80-year-old cable. The actual margin for an 80-year 4/0 ACSR 6/1 conductor between the NESC heavy load and the aged ultimate strength would be 3084 lb.; i.e., there would still be a 53% margin to the aged ultimate strength. Therefore, there would still be a 53% ultimate strength margin based on the actual conductor strength after 80 years of service compared to the 40% ultimate strength margin allow by the NESC for a new cable.

The 4/0 ACSR conductor type has the lowest initial design margin of transmission conductors included in the Ontario Hydro test, so this example bounds in-scope GGNS transmission conductors. This example illustrates with reasonable assurance that transmission conductors will have ample 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 previously identified. A review of plant-specific OE did not identify any unique aging effects for transmission conductors at GGNS.

Therefore, loss of conductor strength is not an aging effect requiring management for 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. 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. 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 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.

Therefore, loss of material due to wear of transmission conductors is not an aging effect requiring management at GGNS.

Therefore, loss of material due to wear of switchyard bus is not an aging effect requiring management at GGNS.

<u>Increased Connection Resistance (Corrosion)</u>

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.

Increased connection resistance due to surface oxidation is a potential aging effect, but 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 GGNS, 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, (GGNS and the industry), this method of installation provides a corrosion-resistant low electrical resistance connection. 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 34.5 kV and 115 kV switchyard and transformer yard connections, which verifies the effectiveness of the connection design and installation practices. GGNS performs infrared inspection of the 34.5 kV and 115 kV switchyard connections and transformer yard connections as part of a periodic preventive maintenance (PM) task to verify the integrity of the connections. This inspection and plant-specific OE verifies that this aging effect is not significant for GGNS.

Therefore, increased connection resistance due to general corrosion resulting from oxidation of switchyard connection metal surfaces is not an aging effect requiring management at GGNS.

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 Electric Power Research Institute (EPRI) license renewal tools do 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 GGNS OE report did not identify any failures of switchyard connections. The design of switchyard bolted connections includes Bellville washers and an antioxidant 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. This combined with the proper sizing of the conductors eliminates 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.

Routine inspections of the GGNS 34.5 kV and 115 kV switchyard and transformer yards includes performing infrared inspection of the 34.5 kV and 115 kV switchyard connections and the transformer yard as part of a periodic PM task to verify the integrity of the connections. Entergy Mississippi and GGNS perform inspections of the 115 kV transmission conductors, including infrared inspections at the Port Gibson substation. These routine inspections, as confirmed by plant-specific OE, confirm that this aging effect is not significant for GGNS.

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 GGNS.

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 GGNS 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 GGNS quality assurance procedures and administrative controls for aging management programs.

3.6.2.3 Time-Limited Aging Analysis

The only TLAAs identified for the EIC 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

EIC 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 EIC 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 EIC 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 environmental qualification (EQ) requirements	Various aging effects due to various mechanisms in accordance with 10 CFR 50.49	Chapter X.E1, "Environmental Qualification (EQ) of Electric Components"	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.
3.6.1-2	High voltage insulators	Loss of material due to mechanical wear caused by wind blowing on transmission conductors	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to GGNS. See Section 3.6.2.2.2 for further evaluation.
3.6.1-3	High voltage insulators	Reduced insulation resistance due to presence of salt deposits or surface contamination	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to GGNS. See Section 3.6.2.2.2 for further evaluation.
3.6.1-4	Transmission conductors	Loss of conductor strength due to corrosion	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to GGNS. 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	Increased resistance of connection due to oxidation or loss of preload	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to GGNS. See Section 3.6.2.2.3 for further evaluation.
3.6.1-6	Switchyard bus and connections	Loss of material due to wind induced abrasion; Increased resistance of connection due to oxidation or loss of preload	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to GGNS. See Section 3.6.2.2.3 for further evaluation.
3.6.1-7	Transmission conductors and connections;	Loss of material due to wind induced abrasion	Plant specific	Yes, plant specific	NUREG-1801 aging effects are not applicable to GGNS. 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.) not subject to 10 CFR 50.49 EQ requirements	Reduced insulation resistance (IR) and electrical failure 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. GGNS EQ electrical and I&C penetration assemblies are covered under the EQ program.
3.6.1-9	Insulation material for electrical cables and connections used in instrumentation circuits not subject to 10 CFR 50.49 EQ requirements that are sensitive to reduction in conductor insulation resistance (IR)	Reduced insulation resistance (IR) and electrical failure 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) not subject to 10 CFR 50.49 EQ requirements	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) and the 115 KV Inaccessible Transmission Cable Programs will manage the effects of aging. Includes inspection and testing of power cables exposed to significant moisture as required. In Table 3.6.2-1, separate lines are used for cables with voltages 400 V to 35kV, and for 115kV.
3.6.1-11	Metal enclosed bus – enclosure assemblies (elastomers)	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	NUREG-1801 aging effects are not applicable to GGNS. A review of GGNS documents indicated that metal enclosed bus are either part of an active device or located in circuits that perform no intended function. Therefore, metal enclosed bus at GGNS is not subject to aging management review.

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	Increased resistance of connection due to the loosening of bolts caused by thermal cycling and ohmic heating	Chapter XI.E4, "Metal Enclosed Bus"	No	NUREG-1801 aging effects are not applicable to GGNS. A review of GGNS documents indicated that metal enclosed bus are either part of an active device or located in circuits that perform no intended function. Therefore, metal enclosed bus at GGNS is not subject to aging management review.
3.6.1-13	Metal enclosed bus – insulation / insulators	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	NUREG-1801 aging effects are not applicable to GGNS. A review of GGNS documents indicated that metal enclosed bus are either part of an active device or located in circuits that perform no intended function. Therefore, metal enclosed bus at GGNS is not subject to aging management review.

Table 3.6.1: Electrical Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-14	Metal enclosed bus – enclosure assemblies (external surface – steel)	Loss of material due to general, pitting, and crevice corrosion	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.S6, "Structures Monitoring"	No	NUREG-1801 aging effects are not applicable to GGNS. A review of GGNS documents indicated that metal enclosed bus are either part of an active device or located in circuits that perform no intended function. Therefore, metal enclosed bus at GGNS is not subject to aging management review.
3.6.1-15	Metal enclosed bus – enclosure assemblies (external surface – galvanized steel, aluminum)	Loss of material due to pitting and crevice corrosion	Chapter XI.E4, "Metal Enclosed Bus," or Chapter XI.S6, "Structures Monitoring"	No	NUREG-1801 aging effects are not applicable to GGNS. A review of GGNS documents indicated that metal enclosed bus are either part of an active device or located in circuits that perform no intended function. Therefore, metal enclosed bus at GGNS is not subject to aging management review.

Table 3.6.1: Electrical Components

Item Number	Component	Aging Effect/ Mechanism	Aging Management Programs	Further Evaluation Recommended	Discussion
3.6.1-16	Fuse holders (not part of a larger assembly) - metallic clamp	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 GGNS. A review of GGNS 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 GGNS 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 a larger assembly) - metallic clamp	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 GGNS. A review of GGNS 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 GGNS do not have aging effects that require an aging management program.
3.6.1-18	Cable connections metallic parts	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 Non-EQ Cable Connections Program (which is a one-time inspection program) will verify the absence of aging effects requiring management.
3.6.1-19	PWR only				

Table 3.6.1: Electrical Components					
Item Number	**Component**	**Aging Effect/ Mechanism**	**Aging Management Programs**	**Further Evaluation Recommended**	**Discussion**
3.6.1-20	Transmission conductors (ACAR)	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 GGNS.
3.6.1-21	Fuse holders (not part of a larger assembly) – Insulation material	None	None	NA – No AEM or AMP	Consistent with NUREG-1801.

Notes for Table 3.6.2-1

Generic notes

A. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

B. Consistent with NUREG-1801 item for component, material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

C. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP is consistent with NUREG-1801 AMP.

D. Component is different, but consistent with NUREG-1801 item for material, environment, aging effect and aging management program. AMP has exceptions to NUREG-1801 AMP.

E. Consistent with NUREG-1801 material, environment, and aging effect but a different aging management program is credited.

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. The fuse holders in the containment penetration panels (1BPZ1A, 1BPZ1B, 1BPZ2A, and 1BPZ2B) are subject to aging management review. The fuses in these panels were evaluated for aging effects (increased connection resistance) that could require management. Increased connection resistance of the metallic portions of the non-EQ fuse holders is caused by mechanical fatigue due to frequent manipulation by plant personnel, and vibration, or thermal fatigue due to ohmic heating, thermal cycling, or electrical transients. In addition, increased connection resistance of the metallic portions of the non-EQ fuse holders is caused by chemical contamination, corrosion, and oxidation; however, in an air, indoor controlled environment, increased connection resistance due to chemical contamination, corrosion and oxidation is not applicable. The penetration protection cabinet fuse holder panels are located in a controlled environment (air, indoor controlled); therefore, the fuse holders in these cabinets do not have aging effects (increased connection resistance of the metallic portions of the non-EQ fuse

holders) caused by chemical contamination, corrosion, and oxidation, so no aging management program is needed for these stressors. In addition, the evaluation of the fuses in the penetration protection cabinet fuse holder panels determined that the aging effects due to thermal fatigue in the form of high resistance caused by ohmic heating, thermal cycling, electrical transients, or mechanical fatigue caused by frequent manipulation (removal/replacement of the fuse), or vibration do not require aging management. Based on the aging management review, these fuse holders do not have aging effects that require an aging management program.

602. The 115 KV Inaccessible Transmission Cable Program is identified as a new plant specific program; however, this program is based on the NUREG-1801, XI.E3 program.

Table 3.6.2-1
Electrical Components
Summary of Aging Management

Table 3.6.2-1 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 3.6.2-1 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	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	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 3.6.2-1 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
Conductor Insulation for inaccessible power cables (115 kV) not subject to 10 CFR 50.49 EQ requirements	CE	Insulation material – various organic polymers	Significant moisture	Reduced insulation resistance (IR)	115 KV Inaccessible Transmission Cable	VI.A.LP-35	3.6.1-10	J, 602
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
Transmission conductors (transmission conductors for SBO recovery)	CE	Aluminum, steel, steel alloy	Air – outdoor	None	None	VI.A.LP-38	3.6.1-4	I

Table 3.6.2-1 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, steel, steel alloy	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

4.0 TIME-LIMITED AGING ANALYSES

This section provides the results of reviews of potential time-limited aging analyses (TLAAs) and exemptions for license renewal 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 TLAAs and a review of the process utilized for identifying and evaluating TLAAs and exemptions for GGNS.

Subsequent sections of this chapter describe TLAAs within the following categories:

- Section 4.2, reactor vessel neutron embrittlement.
- Section 4.3, metal fatigue of vessels, piping, and components.
- Section 4.4, environmental qualification (EQ) of electric equipment.
- Section 4.5, concrete containment tendon prestress.
- Section 4.6, containment liner plate, metal containments, and penetrations fatigue analysis.
- Section 4.7, other plant-specific TLAAs.

References for Section 4 are provided in Section 4.8.

4.1 IDENTIFICATION OF TIME-LIMITED AGING ANALYSES

Time-limited aging analyses are defined in 10 CFR 54.3.

> *Time-limited aging analyses*, for the purposes of this part, are those licensee calculations and analyses that:
>
> (1) Involve systems, structures, and components within the scope of license renewal, as delineated in §54.4(a);
>
> (2) Consider the effects of aging;
>
> (3) Involve time-limited assumptions defined by the current operating term, for example, 40 years;
>
> (4) Were determined to be relevant by the licensee in making a safety determination;
>
> (5) Involve conclusions or provide the basis for conclusions related to the capability of the system, structure, and component to perform its intended functions, as delineated in §54.4(b); and
>
> (6) Are contained or incorporated by reference in the CLB.

Section 10 CFR 54.21(c) requires a list of TLAAs in an application for a renewed license. Section 10 CFR 54.21(c)(2) requires a list of exemptions to 10 CFR 50 based on TLAA 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 <u>Identification of TLAAs</u>

The process used to identify the time-limited aging analyses is consistent with the guidance provided in NEI 95-10, *Industry Guidelines for Implementing the Requirements of 10 CFR 54 – The License Renewal Rule*, Revision 6, June 2005 (Ref. 4-1). Calculations and analyses that potentially meet the definition of 10 CFR 54.3 were identified by searching current licensing basis (CLB) documents including the following.

- Updated Final Safety Analysis Report (UFSAR)
- Technical Specifications and Bases
- Technical Requirements Manual
- Extended power uprate license amendment request (LAR)
- BWRVIP documents referenced in the UFSAR or in docketed licensing correspondence
- Industry topical reports (relevant documents referenced in the UFSAR or in docketed licensing correspondence)
- Fire protection documents
- Inservice Inspection Program documents
- NRC safety evaluation reports (SERs)
- 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); NUREG-1801 (Ref. 4-3); and EPRI Report TR-105090 (Ref. 4-4).

Table 4.1-1 provides a summary listing of the TLAAs that were applicable to GGNS. Table 4.1-2 provides a comparison of the GGNS TLAA to the NUREG-1800 identified TLAA.

4.1.2 Identification of Exemptions

Exemptions for GGNS were identified through a review of the UFSAR, ASME Section XI Program documentation, fire protection documents, the operating license, the Technical Specifications, 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 GGNS TLAAs and Resolution

TLAA Description	Resolution Option	LRA Section
Reactor Vessel Neutron Embrittlement Analyses		4.2
Pressure/temperature limits	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.2.2
Upper-shelf energy	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.3
Reactor vessel circumferential weld inspection relief	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.4
Reactor vessel axial weld failure probability	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.5
Reactor pressure vessel core reflood thermal shock analysis	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.2.6
Metal Fatigue Analyses		4.3
Reactor pressure vessel	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.1.1
Reactor vessel feedwater (FW) nozzles	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.1.2
Reactor pressure vessel internals	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.1.3
Reactor recirculation pumps	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.1.4
Control rod drives	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.1.5
Class 1 piping	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.1.6
Non-Class 1 fatigue analyses	Analyses remain valid 10 CFR 54.21(c)(1)(i)	4.3.2
Effects of reactor water environment on fatigue life	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.3.3
Environmental Qualification Analyses of Electrical Equipment	Aging effect managed 10 CFR 54.21(c)(1)(iii)	4.4

Table 4.1-1 (Continued)
List of GGNS TLAAs and Resolution

TLAA Description	Resolution Option	LRA Section
Concrete Containment Tendon Prestress Analyses	Not a TLAA. GGNS containment design does not include tendons.	4.5
Containment Liner Plate, Metal Containment, and Penetrations Fatigue Analysis		4.6
Containment liner plate, metal containments	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.6.1
Containment penetrations	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.6.2
Other Plant-Specific TLAA		4.7
Erosion of the MSL flow restrictors	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.7.1
Determination of intermediate high energy line break locations	Aging effects managed 10 CFR 54.21(c)(1)(iii)	4.7.2
Fluence effects for the reactor vessel internals	Analysis projected 10 CFR 54.21(c)(1)(ii)	4.7.3

Table 4.1-2
Comparison of GGNS TLAA to NUREG-1800 TLAA

NUREG-1800 TLAA Description	Applicable to GGNS (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. GGNS containment design does not include tendons.	N/A
Inservice local metal containment corrosion analyses	No. GGNS has a Mark III containment with no specific corrosion TLAA.	N/A
NUREG-1800 Table 4.1-3		
Intergranular separation in the heat-affected zone of reactor vessel low-alloy steel under austenitic stainless steel (SS) cladding.	No. Review of GGNS records revealed no TLAA associated with RPV intergranular separation.	N/A
Low-temperature overpressure protection analyses	No. Low-temperature overpressure protection is not applicable to BWRs.	N/A
Fatigue analysis for the main steam supply lines to the turbine-driven auxiliary feedwater pumps	No. GGNS is a BWR that does not have an AFW Pump.	N/A
Fatigue analysis of the reactor coolant pump flywheel	No. GGNS is a BWR and the reactor recirculation pumps do not have flywheels.	N/A
Fatigue analysis of polar crane	No. Evaluations are not based on the current operating term such as 40 years and are therefore not TLAA.	N/A
Flow-induced vibration endurance limit for the reactor vessel internals	No. Evaluations are not based on the current operating term such as 40 years and are therefore not TLAA.	N/A
Transient cycle count assumptions for the reactor vessel internals	Yes	4.3.1.3

Table 4.1-2 (Continued)
Comparison of GGNS TLAA to NUREG-1800 TLAA

NUREG-1800 TLAA Description	Applicable to GGNS (Yes/No)	LRA Section
Ductility reduction of fracture toughness for the reactor vessel internals	Yes	4.7.3
Leak before break	No. GGNS does not credit leak before break.	N/A
Fatigue analysis for the containment liner plate	Yes	4.6.1
Containment penetration pressurization cycles	Yes	4.6.2
Metal corrosion allowance	No. Corrosion allowances for metallic components were reviewed and no TLAA were identified.	N/A
High-energy line-break postulation based on fatigue cumulative factor	Yes	4.7.2
Inservice flaw growth analyses that demonstrate structure stability for 40 years	No. No ASME Section XI components with flaw growth analyses were identified at GGNS.	N/A

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 period of extended operation for GGNS will begin on November 2, 2024, at the end of the original operating license term. The effective full power years (EFPY) of operation is projected to be less than 23.0 EFPY at the end of Cycle 18 in the spring of 2012. The calculated EFPY for 60 years of operation using 2-year operating cycles and a 95 percent average capacity factor (98 percent capacity factor between outages and 25-day outages) is 53.9 EFPY. Consequently, using 54 EFPY to evaluate reactor vessel neutron embrittlement TLAAs for the end of the period of extended operation is appropriate.

GGNS has calculated fluence and adjusted reference temperature (ART), upper shelf energy (USE), pressure-temperature (P-T) limits, and probability of failure of circumferential welds of the reactor pressure vessel (RPV) beltline materials for extended power uprate (EPU) conditions. The fluence calculation determined fluence for 54 EFPY. Additional information is available in the Entergy LAR for the EPU (Ref. 4-5).

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.

Based on operating at EPU power level beginning with Cycle 19, the predicted peak high energy (> 1 MeV) neutron fluence for 54 EFPY is 4.44E+18 n/cm^2 at the vessel inner surface. The neutron fluence for the welds and shells of the reactor pressure vessel (RPV) beltline region was determined using the General Electric-Hitachi (GEH) method for neutron flux calculation documented in report NEDC-32983P-A and approved by the NRC. This method adheres to the guidance provided in RG 1.190 (Ref. 4-9). Results of the fluence evaluation are shown in Table 4.2-1 and used in the evaluations of USE.

UFSAR Figure 5.3-9 identifies the vessel assembly configuration and UFSAR Figure 5.3-13 denotes the weld seams and plate identifiers. Regulations in 10 CFR 50 Appendix G define the beltline as the region of the reactor pressure vessel that directly surrounds the effective height of the active core and adjacent regions of the reactor pressure vessel that are predicted to experience sufficient neutron irradiation damage to be considered in the selection of the most limiting material with regard to radiation damage. In addition, 10 CFR 50 Appendix H requires material surveillance testing only for ferritic materials with neutron fluence at the end of the design life exceeding 1E+17 n/cm2. The extended beltline is thus considered to include the reactor pressure vessel ferritic materials with an end-of-life fluence that exceeds 1E+17 n/cm2. The elevation range within which the projected fluence exceeds 1E+17 n/cm2 for 54 EFPY is -16.5 to +169.5 inches relative to the bottom of the active fuel. The beltline region for 54 EFPY includes plates and welds in shell rings 1 and 2 with the configuration shown on UFSAR Figure 5.3-9. The instrumentation nozzles (N12) will exceed a fluence of 1E+17 n/cm2 at 54 EFPY. No other nozzles are projected to exceed 1E+17 n/cm2 during the period of extended operation.

Table 4.2-1
Peak Fluence at 54 EFPY

Lower-Intermediate Shell and Axial Welds	
Thickness in inches = 6.4375	54 EFPY Peak I.D. fluence = 4.44E+18 n/cm^2
	54 EFPY Peak ¼T fluence = 3.02E+18 n/cm^2
N12 Nozzles	
Thickness in inches = 6.4375	54 EFPY Peak I.D. fluence = 5.40E+17 n/cm^2
	54 EFPY Peak ¼T fluence = 3.67E+17 n/cm^2
Circumferential Weld AB	
Thickness in inches = 6.4375	54 EFPY Peak I.D. fluence = 5.99E+17 n/cm^2
	54 EFPY Peak ¼T fluence = 4.07E+17 n/cm^2
Lower Shell and Axial Welds	
Thickness in inches = 7	54 EFPY Peak I.D. fluence = 5.99E+17 n/cm^2
	54 EFPY Peak ¼T fluence = 3.94E+17 n/cm^2

4.2.2 Pressure-Temperature Limits

Appendix G of 10 CFR 50 requires that the reactor vessel remain within established pressure-temperature (P-T) limits during boltup, hydro-test, pressure tests, normal operation, and anticipated operational occurrences. These limits are calculated using fluence and materials data, including data obtained through the Reactor Vessel Surveillance Program.

The N12 nozzles are evaluated using the fluence at the nozzle and the limiting material properties (chemistry and initial reference temperature (nil-ductility transition) [RT_{NDT}]) of the applicable adjoining shell ring 2 materials. For development of the EPU 35 EFPY P-T curves for the beltline region, the stresses at the N12 nozzles were considered. As part of the EPU submittal, the GGNS P-T curves were reevaluated out to 35 EFPY. A pressure-temperature limits report with additional details of the evaluation was included as Attachment 7 of the EPU submittal (Ref. 4-5).

The provisions of 10 CFR 50 Appendix G require GGNS to operate within the licensed P-T limit curves. These curves are maintained and updated as necessary to maintain plant operation consistent with 10 CFR 50. The GGNS P-T limit curves will be updated as necessary, including through the period of extended operation, in conjunction with the Reactor Vessel Surveillance Program. Appendix B Section B.1.38 provides a description of this aging management program.

The effects of aging associated with the P-T limits will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.2.3 Upper Shelf Energy

USE is evaluated for beltline materials. 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 54 EFPY USE values for the beltline materials were determined using methods consistent with RG 1.99. The value of peak ¼T fluence is used. (Ref. 4-6, 4-8)

The results of this evaluation are shown in Table 4.2-2. The plate A1224-1 was determined in accordance with RG 1.99 Position 2.2 (surveillance data available) as shown in the table. Weld 5P6214B single and tandem were determined in accordance with RG 1.99 Position 2.2 (surveillance data available) as shown in the table. All other locations were determined in accordance with RG 1.99 Position 1.2 (surveillance data not available). For all beltline materials, the USE remains greater than 50 ft-lb for 54 EFPY.

The TLAA for USE has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-2
GGNS Upper Shelf Energy Data for 54 Effective Full-Power Years

Beltline Component	Heat Number	Initial Transverse USE (ft-lb)	% Cu	54 EFPY 1/4 T Fluence (n/cm^2)	% Decrease USE	54 EFPY Transverse USE(1) (ft-lbs)
Shell Plate 2	C2593-2	100	0.04	3.02E+18	14.5	85.5
	C2594-1	94	0.04	3.02E+18	14.5	80.4
	C2594-2	96	0.04	3.02E+18	14.5	82.1
	A1224-1	117	0.04	3.02E+18	14.5	100.0
Shell Plate 1	A1113-1	77	0.12(2)	3.94E+17	10.0	69.3
	C2557-2	66	0.12(2)	3.94E+17	10.0	59.4
	C2506-1	65	0.12(2)	3.94E+17	10.0	58.5
Axial Welds(3): Shell Plate 2	5P6214B/0331 Single	88	0.02	3.02E+18	14.5	75.2
	5P6214B/0331 Tandem	88	0.02	3.02E+18	14.5	75.2
Axial Welds (3) Shell Plate 1	5P6214B/0331 Single	88	0.02	3.94E+17	9.0	80.1
	5P6214B/0331 Tandem	88	0.02	3.94E+17	9.0	80.1
Circumferential Welds: AB(4)	4P7216/0156 Single	90.7	0.03	4.07E+17	9.0	82.5
	4P7216/0156 Tandem	90.7	0.03	4.07E+17	9.0	82.5
Nozzle N12(5)	C2593-2	100	0.04	3.67E+17	9.0	91.0
	C2594-2	96	0.04	3.67E+17	9.0	87.4
	SB166	N/A				
Best Estimate Chemistries from BWRVIP-135 R2						
Plate	A1224-1	147.3	0.035	3.02E+18	14.5	125.9
Plate	A1224-1(6)	117	0.035	3.02E+18	14.5	100.0

Table 4.2-2 (Continued)
GGNS Upper Shelf Energy Data for 54 Effective Full-Power Years

Beltline Component	Heat Number	Initial Transverse USE (ft-lb)	% Cu	54 EFPY 1/4 T Fluence (n/cm^2)	% Decrease USE	54 EFPY Transverse USE$^{(1)}$ (ft-lbs)
Weld	5P6214B/0331 Single	90.9	0.019	3.02E+18	14.5	77.7
Weld	5P6214B/0331 Tandem	91.5	0.019	3.02E+18	14.5	78.2
Weld	5P6214B/0331 Single(6)	88	0.019	3.02E+18	14.5	75.2
Weld	5P6214B/0331 Tandem(6)	88	0.019	3.02E+18	14.5	75.2
Weld	4P7216/0156 Single	90.7	0.038	4.07E+17	9.0	82.5
Weld	4P7216/0156 Tandem	90.7	0.038	4.07E+17	9.0	82.5
Integrated Surveillance Program (BWRVIP-135 R2)						
Plate	A1224-1(7)(8)	147.3	0.03	3.02E+18	9.6	133.2
Plate	A1224-1(6)(8)	117	0.03	3.02E+18	9.6	105.8
Weld	5P6214B/0331 Single(7)	90.9	0.02	3.02E+18	9.4	82.4
Weld	5P6214B/0331 Tandem(7)	91.5	0.02	3.02E+18	9.4	82.9
Weld	5P6214B/0331 Single(6)	88	0.02	3.02E+18	9.4	79.7
Weld	5P6214B/0331 Tandem(6)	88	0.02	3.02E+18	9.4	79.7

1. USE = initial transverse USE * [1 - (% decrease / 100)]
2. Copper content is not available; therefore, the maximum allowable %Cu was obtained from the vessel design specification.
3. Use of SMAW Heats 422K8511, 627069, 626677, and 627260 was determined to be limited to weld pick-ups at the ID/OD surfaces or initial root pass or sealing at the backing bars which were ground out or subsequently removed. Certified material test reports indicate that no SMAW weld material is present at either the ¼T or 3/4T location. Therefore, these heats do not require evaluation as part of the beltline region.
4. Weld AB occurs within the extended beltline region, defined as experiencing a fluence > 1.0E+17 n/cm^2.

5. The N12 water level instrument nozzle occurs in the beltline region. For GGNS the forging is fabricated from stainless steel, and the welds connecting the forging to the vessel are SB166 material. These nozzles occur in only two of the shell 2 plates.
6. The material is evaluated using the GGNS unirradiated USE to illustrate the difference and that the material is acceptable.
7. The material is evaluated using the ISP unirradiated USE to illustrate the difference and that the material is acceptable.
8. Percent decrease in USE has been adjusted because the measured decrease exceeds the predicted RG 1.99 decrease.

4.2.4 Reactor Vessel Circumferential Weld Inspection Relief

Relief from reactor vessel circumferential weld ISI examination requirements was granted on April 11, 2001 (Ref. 4-10). The relief request is based on BWRVIP-05 and the guidance provided in Generic Letter 98-05. The SER stated the exemption was applicable for the remaining term of the original operating license.

Relief from reactor pressure vessel circumferential weld examination is based on probabilistic assessments that predict an acceptably low probability of failure. The circumferential weld examination relief analysis includes evaluation of the adjusted reference temperature of the reactor vessel beltline and therefore meets the TLAA definition.

Evaluation of the circumferential weld inspection relief was included in the EPU submittal as Table 2.1-3 of Attachment 5B. The evaluation considered the effects of the increased power out to 35 EFPY. The same methodology used in the EPU reanalysis was used to evaluate the acceptability of the inspection relief for 54 EFPY.

The reactor vessel was fabricated by Chicago Bridge and Iron. Table 4.2-3 provides the comparison of the mean adjusted reference temperature of the beltline circumferential welds to the Chicago Bridge and Iron reactor vessel evaluated in BWRVIP-74A. This table uses the 54 EFPY surface fluence rather than ¼T fluence and no margin for RT_{NDT}. The beltline circumferential weld material RT_{NDT} remains less than the requirements of Generic Letter (GL) 98-05 and the SE to BWRVIP-74 using the 54 EFPY values for fluence. As such, the conditional probability of failure for circumferential welds remains below that stated in the NRC's Final Safety Evaluation of BWRVIP-05.

The operations specific training and procedures to minimize the potential for RPV cold over-pressurization events have been implemented.

Axial weld examinations are completed on essentially 100 percent of the axial welds. Axial weld examinations to date have not revealed an active mechanistic mode of degradation in the axial welds. In accordance with the BWRVIP-05 SER, examination of the circumferential welds will be performed if axial weld examinations reveal an active mechanistic mode of degradation.

A request for extension of this relief for the extended operating period will be submitted to the NRC in accordance with 10 CFR 50.55(a).

The reactor vessel circumferential weld inspection relief for the extended operating period has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

Table 4.2-3
GGNS Circumferential Weld Evaluation for 54 EFPY

Parameter Description	NRC Staff Assessment for 64 EFPY (Circ Welds- CB&I RPV)(1)	GGNS AB (Lower Circ Seam)(2,3)
Weld copper content, %	0.1	0.03
Weld nickel content, %	0.99	0.81
Weld chemistry factor (CF)	134.9	41
Neutron fluence at the end of the requested relief period, n/cm^2	1.02E+19	0.444E+19
Initial reference temperature (RT_{NDT}), ºF	-65	-40
Increase in reference temperature (ΔRT_{NDT}), ºF (4)	135.6	32
Mean adjusted reference temperature (ART), ºF	70.6	-8
P (F/E) (5)	1.78E-5	(Note 5)

1. Data from Table 2.6-5 of SER for BWRVIP-05 with CF of 134.9 from EPU LAR, Table 2.1-3.
2. 54 EFPY fluence value is from Table 4.2-1.
3. Weld AB is approximately 5 inches below the active core but in the extended beltline and is evaluated conservatively using the value of peak fluence at 54 EFPY.
4. $\Delta RT_{NDT} = CF \times f^{(0.28 - 0.10 \log f)}$
5. P (F/E) stands for "Probability of a failure event." Although a conditional failure probability has not been calculated, the fact that the GGNS value for mean adjusted reference temperature at the end of the period of extended operation is less than the 64 EFPY value provided by the NRC indicates that the GGNS RPV conditional failure probability is less than that evaluated in the NRC analysis.

4.2.5 Reactor Vessel Axial Weld Failure Probability

The NRC SER for BWRVIP-74-A evaluated the failure frequency of axially oriented welds in BWR reactor vessels. Applicants for license renewal must evaluate axially oriented RPV welds to show that their failure frequency remains below the value calculated in the BWRVIP-74 SER. The SER states that an acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in the SER.

Table 4.2-4 compares the GGNS reactor vessel limiting axial weld parameters to those used by the NRC analysis in BWRVIP-74. This table uses surface (0T) fluence rather than ¼T fluence and no margin for RT_{NDT}.

Table 4.2-4
Effects of Irradiation on GGNS Reactor Vessel Axial Weld Properties

Parameter Description	GGNS Data for Weld 5P6214B/0331 Tandem
Neutron fluence, (f) n/cm^2	0.444E+19$^{(1)}$
Weld copper content, %	0.02
Weld nickel content, %	0.82
Weld chemistry factor (CF)	27
Initial (unirradiated) reference temperature (RT_{NDT}), ºF	-40
Increase in reference temperature (ΔRT_{NDT}), ºF $^{(2)}$	21
Mean adjusted reference temperature (ART), ºF ($RT_{NDT} + \Delta RT_{NDT}$)	-19

1. Value is from Table 4.2-1.
2. $\Delta RT_{NDT} = CF \times f^{(0.28 - 0.10 \log f)}$

The projected 54 EFPY GGNS mean ART (-19ºF) is less than the bounding 114ºF shown in the NRC SER for BWRVIP-74 (based on a calculation performed to identify the mean RT_{NDT} value required to provide a result which closely matches the RPV failure frequency of 5E-6 per reactor-year).

Reactor vessel axial weld TLAA has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.2.6 Reactor Pressure Vessel Core Reflood Thermal Shock Analysis

General Electric Report NEDO-10029 is referenced in Section 5.3.3 of the UFSAR. NEDO-10029 addressed the concern for brittle fracture of the reactor pressure vessel due to reflood following a postulated loss of coolant accident (LOCA). The thermal shock analysis documented in the report assumed a design basis LOCA followed by a low pressure coolant injection (LPCI) accounting for the effects of neutron embrittlement at the end of 40 years. This analysis bounded 40 years of operation. Therefore, reflood thermal shock of the reactor pressure vessel has been identified as a TLAA for GGNS requiring evaluation for the period of extended operation.

In addition to NEDO-10029 that is listed in the UFSAR, there is a more recent analysis of the BWR-6 vessels (Ranganath, S., "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979). The more recent analysis is appropriate for the GGNS reactor pressure vessel because it evaluates the bounding LOCA event, a main steam line break, for a BWR-6 vessel design.

This analysis shows that when the peak stress intensity occurs at approximately 300 seconds after the LOCA, the temperature inside the vessel wall is approximately 400°F. The maximum ART value calculated for the GGNS RPV beltline material is 53°F. Using the equation for K_{IC} presented in Appendix A of ASME Section XI and the maximum ART value, the material reaches upper shelf at ~158°F. The minimum 400°F temperature predicted for the thermal shock event at the time of peak stress intensity remains well above the ~158°F value at which the material would transition from the upper shelf. Therefore, the revised analysis has projected the TLAA through the period of extended operation.

Reactor pressure vessel core reflood thermal shock TLAA has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.3 METAL FATIGUE

Fatigue analyses are TLAA 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 (Section 3) for GGNS 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 GGNS 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 factors (F_{en}) and environmentally adjusted CUFs is documented in Section 4.3.3.

4.3.1 Class 1 Fatigue

Class 1 components and systems at GGNS that have fatigue analyses include the reactor vessel, the reactor vessel internals, and Class 1 piping. Fatigue evaluations were performed in the design of GGNS Class 1 components in accordance with their design requirements. ASME Section III fatigue evaluations are contained in analyses and stress reports, and because they are based on a number of transient cycles assumed for a 40-year operating term, these evaluations are considered TLAA.

Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications provided the initial set of transients used in the design of the components.

The Fatigue Monitoring Program tracks and evaluates transient cycles and requires corrective actions if limits are approached. The Fatigue Monitoring Program ensures that the numbers of transient cycles experienced by the plant remain within the allowable numbers of cycles. Further details on the Fatigue Monitoring Program are provided in LRA Appendix B.

Based on the numbers of cycles accrued to date, Entergy projected the numbers of accrued cycles expected at the end of 60 years of operation. Table 4.3-1 shows the projected values through the period of extended operation based on the rate of occurrence for the previous 10 years. There are several locations whose projections exceed design limits. As additional operating data is accumulated, subsequent projections will refine the estimate of the numbers of cycles expected through 60 years of operation. The Fatigue Monitoring Program will ensure that the accrued numbers of cycles of all design transients will remain below the numbers of cycles evaluated in the fatigue analyses.

GGNS is using stress-based fatigue monitoring on the feedwater nozzle, the high pressure core spray nozzle, and the feedwater weldolets (where the feedwater leakage control line joins the feedwater line).

Table 4.3-1
Projected and Analyzed Transient Cycles

Event Name	Through 12/31/99	Through 5/26/10	Rate per Year(1)	60-Yr Projection(2)	Allowable	% of Allowable at 60 Years(5)
Boltup	15	22	0.67	45	123	37
Design Hydrotest	15	22	0.67	45	40/50(3)	90
Startup	66	80	1.35	126	120	105
Turbine Roll to Rated Power	67	88	2.02	158	120	132
Turbine Bypass	1	1	0.00	1	10	10
Partial FW Heater Bypass	22	22	0.00	22	70	31
SCRAM	54	65	1.06	101	180	56
Reduction to 0% Power	63	77	1.35	123	111	111
Hot Standby	56	57	0.10	60	111	54
Initial Shutdown	63	77	1.35	123	106	116
Vessel Flooding	63	77	1.35	123	106	116
Shutdown Cooling	63	77	1.35	123	106	116
Unbolt	14	21	0.67	44	123	36
Loss of Feedpumps	9	9	0.00	> 10(7)	10	> 100
SRV Blowdown	2	2	0.00	2	8	25
SRV w/ Normal Operation	162	162	0.00	162	1580	10
Single SRV Actuation	178	300	11.73	704	1580	45

Table 4.3-1 (Continued)
Projected and Analyzed Transient Cycles

Event Name	Through 12/31/99	Through 5/26/10	Rate per Year(1)	60-Yr Projection(2)	Allowable	% of Allowable at 60 Years(5)
Multiple SRV Actuation	17	18	0.10	21	220	10
HPCS Injection	14	18	0.38	31	40	78
LPCS Injection	0	0	0.00	1(4)	10	10
LPCI A Injection	1	1	0.00	1	5	10
LPCI B Injection	0	0	0.00	1(4)	5	20
LPCI C Injection	0	0	0.00	1(4)	5	20
Operating Basis Earthquake	0	0	0.00	0(4)	1(6)	0

1. This column was calculated using an average rate between 12/31/99 and 5/26/10 (~10.4 years). Difference in cycles between specified dates is divided by 10.4 to obtain the rate per year during that time period.
2. This column is calculated using the end of the PEO as 11/1/2044. This is ~34.5 years beyond the 5/26/2010 data date. The 60-year projected number of cycles is the sum of the number of cycles as of 5/26/2010 plus the (rate per year) multiplied by (34.5 years) with rounding.
3. Forty cycles of pressurization were originally analyzed with a pressure of 1250 psig. Since the test is performed at less than 1050 psig, the allowable has been recalculated as 50 cycles.
4. For all transients with no prior occurrence, other than operating basis earthquake, a 60-year projection of 1 was assumed.
5. The site in the current operating term uses stress-based fatigue monitoring of locations that are projected to exceed their originally specified cycles.
6. As described in UFSAR Section 3.7.3.2, one Operating Basis Earthquake (OBE) intensity earthquake with 10 peak stress cycles is postulated for purposes of fatigue evaluation.
7. Although the transient Loss of Feedpumps did not occur in the last 10 years, it is expected to occur. Stress-based fatigue is utilized to evaluate this transient. See Section 4.3.1.2.

4.3.1.1 Reactor Vessel

The reactor vessel is described in UFSAR Section 5.3.3. A reactor vessel cutaway diagram is shown in UFSAR Figure 5.3-1. UFSAR Table 5.2-4 defines the materials and specifications.

As described in the UFSAR Section 5.3.3.3, the reactor pressure vessel is fabricated in accordance with ASME Code, Section III, Class 1 requirements. The reactor pressure vessel fatigue analyses were performed in accordance with the ASME Boiler and Pressure Vessel Code, Section III, its interpretations, and applicable requirements for Class A vessels as defined therein, as of the order date of December, 1972. The fatigue analyses of the reactor vessel are considered TLAA because they are based on numbers of cycles expected in 40 years of operation.

Table 4.3-2 lists the cumulative usage factors for reactor vessel critical locations.

GGNS will monitor transient cycles using the Fatigue Monitoring Program and assure that action 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 4.3-2
Cumulative Usage Factors for the Reactor Vessel

Location	Usage Factor
Core spray bracket	0.844
Core spray nozzle	0.564
CRD housing	0.107
CRD penetration	0.126
CRD hydraulic system return nozzle	0.576
Drain nozzle	0.534
Feedwater nozzle(1) • Carbon steel replacement safe end • Stainless steel clad replacement safe end • Low alloy steel forging	 0.886 0.620 0.580
Flange closure studs	0.863
Guide rod bracket	0.906
Incore housing	0.044

Table 4.3-2 (Continued)
Cumulative Usage Factors for the Reactor Vessel

Location	Usage Factor
Incore penetration	0.044
Jet pump instrumentation nozzle	0.534
Liquid control-ΔP nozzle	0.019
Main closure flange	0.372
Main shell	0.037
Main steam outlet nozzle	0.604
Recirculation inlet nozzle	0.685
Recirculation outlet nozzle	0.549
Refueling bellows	0.822
RHR-LPCI nozzle	0.564
RPV steam water interface	0.0365
Shroud support	0.656
Stabilizer bracket	0.789
Steam dryer hold down bracket (on head) and stream dryer support bracket (in vessel)	0.906
Support skirt	0.920
Top head lifting lug	0.906
Top head nozzles	0.790
Vent and head spray	0.220
Vibration instrumentation nozzle	0.540
Water level instrumentation nozzle	0.534

1. See Section 4.3.1.2 for further information.

4.3.1.2 Reactor Vessel Feedwater Nozzle

As described in UFSAR Section 5.3.3.1.4.5.1, the GGNS design includes features to eliminate thermal fatigue concerns identified in previous BWR feedwater nozzle designs. A second piston ring and triple thermal sleeves have been incorporated in the design for the nozzle.

The analysis of the feedwater nozzle determined fatigue usage from potential rapid cycling behind the thermal sleeves that is added to the fatigue usage based on monitored plant transients. The usage due to the rapid cycling effect is postulated based on time and feedwater temperature.

The feedwater nozzle fatigue due to plant transients and the rapid cycling fatigue were reanalyzed for EPU operating conditions. This feedwater nozzle will be reanalyzed to consider the effects of reactor water environment on fatigue. The reanalysis will consider the appropriate transient cycles including the impact of potential rapid cycling as necessary. This action is an element of the Fatigue Monitoring Program described in Appendix B.

As such, the effects of fatigue on the feedwater nozzles will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.3 Reactor Pressure Vessel Internals

The RPV internals consist of the core support structure and non-core support structure components. The core support structure components are ASME code components. ASME code requirements do not apply to the non-core support structure components, but the methods of the ASME code were used in their design. The original analyses for the core support structure utilized the 1974 edition with addenda up to and including the Summer 1976 Addenda.

A general assembly drawing of RPV internals components is shown in UFSAR Figure 3.9-8. The fatigue analyses of the reactor vessel internals were reviewed as part of extended power uprate. The fatigue usage factors for the RPV internals components are shown in Table 4.3-3.

GGNS will monitor transient cycles using the Fatigue Monitoring Program and assure that action is taken before the numbers of accrued cycles exceed their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor vessel internals in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-3
RPV Internals Usage Factors

Component	Usage Factor
Shroud support	0.098
Shroud	0.56
Core plate	0.9
Top guide	0.018
Control rod drive housing (CRDH)	0.107
Feedwater sparger	0.961
Jet pump assembly	0.946
Core spray line and sparger	0.83
Access hole cover	0.24
Shroud head and separator assembly	0.906
In-core housing and guide tube (ICH&GT)	0.013
Vessel head cooling spray nozzle	0.79

4.3.1.4 Reactor Recirculation Pumps

UFSAR Section 3.9.1.2.1.4 describes the Byron-Jackson recirculation pump fatigue analysis. The fatigue analysis for the reactor recirculation pump casing considered the RCS fatigue transients specified by GE. The analysis justified exempting portions of the case from analysis and determined that the remaining locations met 1974 ASME Section III code fatigue requirements. Usage factors were calculated for several locations in the pump cover that were later reanalyzed due to modifications to install shaft sleeves and modify the seal water heat exchanger.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor recirculation pumps in accordance with 10 CFR 54.21(c)(1)(iii).

4.3.1.5 Control Rod Drives

The Class 1 portions of the control rod drives were analyzed for fatigue. The cumulative usage factors (CUFs) are low and the tracking of cycles under the Fatigue Monitoring Program ensures the fatigue on these components remains acceptable. 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).

Table 4.3-4
Control Rod Drives Usage Factors

Location	CUF
Main flange	0.15
Ring flange	~0.0
Indicator tube base weld	0.01
Indicator tube cap weld	0.08
Lower and upper piston tube connection	0.005
Lower piston tube threads	0.20
Flange plug #1	0.01
Flange plug #2	~0.0

4.3.1.6 Class 1 Piping

UFSAR Table 3.2-1 provides a summary of the safety classes for the principal structures, systems, and components of the plant. Components of the reactor coolant pressure boundary, whose failure could cause a loss of reactor coolant at a rate in excess of the normal makeup system capability, are ASME Section III Class 1 components. ASME Section III Class 1 piping is shown on the following LRA drawings.

System (System Code)	LRA Drawing(s)
Reactor System (B13)	LRA-M-1081B (CRD mechanism)
Nuclear Boiler System (B21)	LRA-M-1077A LRA-M-1077B LRA M-1077D LRA-M 1077E
Reactor Recirculation System (B33)	LRA-M-1078A LRA-M-1078B LRA M-1078E
Standby Liquid Control System (C41)	LRA-M-1082
Residual Heat Removal System (E12)	LRA-M-1085A LRA-M-1085B LRA M-1085C
Low Pressure Core Spray System (E21)	LRA-M-1087
High Pressure Core Spray System (E22)	LRA-M-1086
Leak Detection System (E31)	LRA-M-1090A
MSIV–Leakage Control System (E32)	LRA-M-1097
Feedwater Leakage Control System (E38)	LRA-M-1112
Reactor Core Isolation Cooling System (E51)	LRA-M-1083B
Reactor Water Cleanup System (G33)	LRA-M-1079

This GGNS ASME Class 1 piping specifications identified that ASME Class 1 piping must be analyzed for the cycles identified on General Electric transient cycle drawings. Detailed fatigue analyses were generated for GGNS to analyze multiple locations on each system within the ASME Class 1 boundary. Table 4.3-5 provides the highest CUF values identified in the analyses for each system containing Class 1 piping. The values listed in Table 4.3-5 are from the analysis of record and do not include the effects of reactor water environment (environmentally assisted fatigue). See Section 4.3.3 for the evaluation of environmentally assisted fatigue.

The GGNS Fatigue Monitoring Program will monitor the cycles actually incurred to assure that action is taken if the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the ASME Section III piping in accordance with 10 CFR 54.21(c)(1)(iii).

Table 4.3-5
CUF Values for Class 1 System Components

ASME Class 1 Location	CUF
Reactor recirculation piping	0.101
Reactor recirculation flow control valve	0.278
Feedwater piping	0.4138
Main steam piping	0.074
MSIV leakage control piping	0.355
Main steam drain piping	0.8644
High pressure core spray piping	0.3225
Low pressure core spray piping	0.164
Reactor head vent piping	0.2122
Reactor water cleanup piping	0.1379
RHR shutdown suction piping	0.1411
RHR return line/ low pressure core injection piping	0.3421
Standby liquid control piping	0.088
Feedwater leakage control piping	0.37
Small bore piping/instrument lines	0.71

4.3.2 Non-Class 1 Fatigue

4.3.2.1 Piping and In-Line Components

UFSAR Table 3.2-1 provides a summary of the safety classes for the principal structures, systems, and components of the plant. As identified in the UFSAR Table 3.2-1, the Non-Class 1 piping in the scope of license renewal is built to ASME III -Code Class 2 or 3 or ANSI B31.1.

The impact of thermal cycles on non-Class 1 components is addressed in the calculation of the allowable stress range. The design of ASME III Code Class 2 and 3 or ANSI B31.1 piping systems incorporates a stress range reduction factor for 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.

Thermal cycles for the non-Class 1 systems have been evaluated for 60 years of plant operation. For many plant systems, significant temperature cycles are coincident with plant heatups and cooldowns, which are limited to well below 7000 cycles as shown in Table 4.3-1.

Other systems with transients that occur independent of plant heatups and cooldowns are discussed below. The emergency diesel generators and fire pump diesel engine are tested periodically (approximately monthly), which will not result in the total number of cycles exceeding 7000. The CRD system experiences temperature changes during a plant trip, but plant trips are limited to less than 7000. GGNS primarily samples utilizing a continuous flow sample stream that is not isolated between samples. Special samples may be drawn infrequently through isolated lines and result in a thermal cycle. However, use of these special samples is infrequent and will not exceed 7000 cycles through 60 years of operation. These individual system evaluations indicate that 7000 thermal cycles will not be exceeded for 60 years of operation.

Therefore, the non-Class 1 piping 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-Piping Components

Non-class 1 components other than piping system components require fatigue analyses if they were built to a section of the code such as ASME Section III, NC-3200 or ASME Section VIII, Division 2. A review of the non-Class 1 components other than piping identified non-Class 1 fatigue analysis applicable to expansion joints. Design specifications and calculations were identified for expansion joints with fatigue analyses for a bounding number of cycles, which were identified as time limited aging analyses. Evaluation of these analyses determined the number of cycles were adequate for 60 years of operation. Therefore, the non-Class 1 expansion joint TLAAs are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

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 at low temperatures. Although the fatigue curves derived from laboratory tests were adjusted to account for effects such as data scatter, size, and surface finish, these adjustments may not be sufficient to account for actual reactor water 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 correction factors to fatigue analyses (CUFs) and identifies locations of interest for consideration of environmental effects. (Ref. 4-14) Section 5.6 of NUREG/CR-6260 identified the following component locations to be the most sensitive to environmental effects for newer vintage General Electric plants. These locations are directly relevant to GGNS.

1. Reactor vessel shell and lower head
2. Reactor vessel feedwater nozzle
3. Reactor recirculation piping (including inlet and outlet nozzles)
4. Core spray line reactor vessel nozzle and associated Class 1 piping
5. Residual heat removal nozzles and associated Class 1 piping
6. Feedwater line Class 1 piping

GGNS evaluated these six locations using the guidance provided in NUREG-1801 Revision 2. Additional locations were also evaluated beyond the six locations identified in NUREG/CR-6260. Specifically the highest usage factor (CUF) was evaluated in the piping in the feedwater, reactor recirculation, RHR, LPCS, and HPCS systems. NUREG-1801 Revision 2 calls for using the guidance (formulas) provided in NUREG/CR-6909 (Ref. 4-16) to calculate environmentally assisted fatigue correction factors (F_{en}) for nickel alloy components but specifies that NUREG/CR-6583 (Ref. 4-15) may be used for carbon and low alloy steel and NUREG/CR-5704 (Ref. 4-13) may be used for austenitic stainless steel.

GGNS initiated moderate hydrogen water chemistry (HWC-M) control in May of 1999. In April 2007, the injection rate was increased to the current injection rate of 102 SCFM. The evaluation of EAF included an evaluation of the water chemistry history to determine the cumulative environment for the components when determining the dissolved oxygen. GGNS began commercial operation on July 1, 1985. Hydrogen water chemistry (HWC) was fully implemented in April 2007. Therefore, there were 21.75 years of operation before HWC was fully implemented. The goal for availability of HWC is 98%, but a more conservative 95% availability was used in this analysis. With a 95% availability of HWC applied for the remainder of the expected 60-year operating term, 36.3 years (0.95[60 - 21.75]) will have been with HWC. The remainder will be evaluated with dissolved oxygen levels present prior to implementation of HWC.

Based on water samples taken prior to HWC control, 200 ppb dissolved oxygen is considered a representative value for the water chemistry in the reactor vessel and attached piping (other than feedwater) for the period of operation prior to HWC. Prior to the implementation of HWC, a representative value for feedwater dissolved oxygen based on sampling is 60 ppb. Following implementation of HWC, the oxygen concentrations in the vessel and attached piping (other than feedwater) are in the range of less than 5 ppb. These are below the 50 ppb threshold value specified in NUREG/CR-6583 and NUREG/CR-5704 for evaluation of F_{en}. To limit the susceptibility of the feedwater system piping to flow accelerated corrosion, the feedwater dissolved oxygen is maintained within the 30-100 ppb range with 70 ppb considered a representative nominal value.

The following equations were utilized in determining environmental fatigue correction factors.

Carbon Steel

The environmentally assisted fatigue correction factor (F_{en}) for carbon steel (CS) is calculated using NUREG/CR-6583, Equation 6.5a.

Low Alloy Steel

The environmentally assisted fatigue correction factor (F_{en}) for low alloy steel (LAS) is calculated using NUREG/CR-6583, Eq. 6.5b.

Wrought and Cast Austenitic Stainless Steels

The environmentally assisted fatigue correction factor (F_{en}) for wrought and cast austenitic stainless steels is calculated using NUREG/CR-5704, Eq. 13.

Nickel-Chromium-Iron (Ni-Cr-Fe) Alloys

The environmentally assisted fatigue correction factor (F_{en}) for Ni-Cr-Fe alloys is calculated using NUREG/CR-6909, Eq. A.14. To recalculate F_{en} using NUREG-6909 requires the use of updated fatigue tables. This will be addressed by the commitment identified in this section to complete a reanalysis prior to the period of extended operation.

As shown in the table, this screening has determined that there are locations that, when accounting for environmental effects, have projected usage factors greater than 1.0. GGNS will update the fatigue usage calculations using refined fatigue analyses to determine valid CUFs less than 1.0 when accounting for the effects of reactor water environment prior to the period of extended operation. This includes applying the appropriate F_{en} factors to valid CUFs determined using an NRC-approved version of the ASME code or NRC-approved alternative (e.g., NRC-approved code case). GGNS will review design basis ASME Class 1 component fatigue evaluations to ensure the GGNS locations evaluated for the effects of the reactor coolant environment on fatigue include the most limiting components within the reactor coolant pressure boundary. Environmental effects on fatigue for these critical components will be evaluated using one of the following sets of formulae.

Carbon and Low Alloy Steels

- Those provided in NUREG/CR-6583, using the applicable ASME Section III fatigue design curve.
- Those provided in Appendix A of NUREG/CR-6909, using either the applicable ASME Section III fatigue design curve or the fatigue design curve for carbon and low alloy steel provided in NUREG/CR-6909 (Figures A.1 and A.2, respectively, and Table A.1).
- A staff approved alternative.

Austenitic Stainless Steels

- Those provided in NUREG/CR-5704, using the applicable ASME Section III fatigue design curve.
- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).
- A staff approved alternative.

Nickel Alloys

- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).
- A staff approved alternative.

If an acceptable CUF cannot be calculated, GGNS will repair or replace the affected locations before exceeding an environmentally adjusted CUF of 1.0.

GGNS 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).

Table 4.3-6
EAF Screening of GGNS Locations

NUREG/CR-6260 Generic Location		GGNS Location	Material[2]	CUF	F_{en}	EAF CUF
1	Reactor vessel shell and lower head	CRD housing	SS	0.107	12.6	> 1
2	Reactor vessel feedwater nozzle	FW nozzle to shell junction	LAS	0.580	3.46	> 1
2	Reactor vessel feedwater nozzle	FW nozzle safe end	LAS	0.886	3.46	> 1
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RR inlet nozzle forging	LAS	0.685	10.05	> 1
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RR inlet nozzle nickel alloy safe end	NBA	Note 1	3.03	Note 1
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RR inlet nozzle stainless steel extension	SS	0.0009	12.6	0.01
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RR outlet nozzle forging	LAS	0.549	10.05	> 1
3	Reactor recirculation piping (including inlet and outlet nozzles)	Reactor vessel RR outlet nozzle stainless steel safe end	SS	0.0019	12.6	0.02
3	Reactor recirculation piping (including inlet and outlet nozzles)	RR piping	SS	0.1	12.6	> 1
4	Core spray line reactor vessel nozzle and associated Class 1 piping	LPCS reactor vessel nozzle	LAS	0.564	10.05	> 1
4	Core spray line reactor vessel nozzle and associated Class 1 piping	LPCS reactor vessel nozzle safe end	NBA	Note 1	3.03	Note 1
4	Core spray line reactor vessel nozzle and associated Class 1 piping	LPCS reactor vessel nozzle extension	LAS	0.046	10.05	0.46

Table 4.3-6 (Continued)
EAF Screening of GGNS Locations

NUREG/CR-6260 Generic Location		GGNS Location	Material[2]	CUF	F_{en}	EAF CUF
4	Core spray line reactor vessel nozzle and associated Class 1 piping	LPCS piping (below 150C threshold)	CS	0.164	1.74	0.29
4	Core spray line reactor vessel nozzle and associated Class 1 piping	HPCS reactor vessel nozzle	LAS	0.564	10.05	> 1
4	Core spray line reactor vessel nozzle and associated Class 1 piping	HPCS reactor vessel nozzle safe end	NBA	Note 1	3.03	Note 1
4	Core spray line reactor vessel nozzle and associated Class 1 piping	HPCS piping (below 150C threshold)	CS	0.3225	1.74	0.56
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	Reactor vessel nozzle – RHR	LAS	0.564	10.05	> 1
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	RHR nozzle safe end	NBA	Note 1	3.03	Note 1
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	RHR piping at vessel	CS	0.0718	7.14	0.51
5	Residual Heat Removal (RHR) nozzles and associated Class 1 piping	RHR piping (below 150C threshold)	CS	0.3421	1.74	0.60
6	Feedwater line Class 1 piping	FW piping	CS	0.2228	2.46	0.55
NA	Reactor water cleanup piping	RWCU piping	CS	0.1379	7.14	0.99

1. This is a nickel-based alloy location that will require recalculation of usage factor with new fatigue curves in accordance with NUREG/CR-6909.
2. Material types:
   CS: carbon steel
   LAS: low alloy steel
   SS: stainless steel
   NBA: nickel-based alloy.

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 the EQ program and also provides the requirements the EQ program must meet. Qualification is based on 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 TLAA for license renewal.

The GGNS Environmental Qualification (EQ) of Electric Components Program manages component thermal, radiation, and cyclical aging, as applicable, through the use of aging evaluations based on 10 CFR 50.49(f) qualification methods. As required by 10 CFR 50.49, EQ components 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 GGNS EQ Program ensures that the EQ components are maintained in accordance with their qualification bases.

The GGNS Environmental Qualification (EQ) of Electric Components Program is an existing program established to meet GGNS commitments for 10 CFR 50.49. The program is consistent with NUREG-1801, Section X.E1, "Environmental Qualification (EQ) of Electric Components." The GGNS Environmental Qualification (EQ) of Electric Components 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 GGNS containment design does not include tendons.

4.6 CONTAINMENT LINER PLATE, METAL CONTAINMENTS, AND PENETRATIONS FATIGUE ANALYSIS

4.6.1 Containment Liner Plate, Metal Containments

Grand Gulf utilizes a BWR Mark III containment. As described in UFSAR Section 3.8.1.3, the containment was designed in accordance with the loads defined in GE Topical Report NEDO 11314-08 (GESSAR Appendix 3B). Additional loads defined in GE document 22A4365, Interim Containment Loads Report (ICLR), Rev. 2, and later defined by GE document 22A7000, Rev. 2 (GESSAR II, Appendix 3B; see Grand Gulf FSAR, Appendix 6D), have been considered for the final design verification of the containment.

UFSAR Appendix 6A, Section 3BA.7.2.2.3 (page 6A-14) indicates that the quenchers were designed for a conservatively high value of 18,000 cycles. The usage factors for the quenchers were calculated to be much less than 1 even with 18,000 cycles (see listings in Table 4.6-1). The SRV actuations are tracked and will be maintained well below the value used in the quencher fatigue evaluation.

UFSAR Section 3.8.1.4.2 discusses the analysis of the suppression pool and cylinder wall liner plate. Fatigue analysis for the suppression pool and cylinder wall liner plate was performed using subsections NE and NB of the ASME Code, Section III, Division I, 1971 Edition with Summer of 1973 Addenda. The calculated fatigue usage was minimal (< 0.02) with a total number of 19,362 cycles (including heatups and cooldowns, seismic cycles, SRV actuations). The heatups and cooldowns, seismic cycles, and SRV actuations are tracked against limits that are well below the total cycle value used in the liner fatigue evaluation.

GGNS will monitor transient cycles using the Fatigue Monitoring Program and assure that action is taken if any of the monitored cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the primary containment in accordance with 10 CFR 54.21(c)(1)(iii). The GGNS Fatigue Monitoring Program is further described in Appendix B.

Table 4.6-1
Usage Factors Calculated for the Quenchers and Containment Liner

Location	Usage Factor
Quencher arm	0.018
Quencher arm to shell juncture	0.018
Support arm	0.018
Support arm weld	0.018
Support arm to shell	0.23
Stiffening ring	0.018
Liner plate	< 0.02

4.6.2 Containment Penetrations

ASME Class 1 piping that has guard pipes with flued heads for containment penetrations welded to the piping has individual analyses for the fatigue at each of the penetrations. These analyses evaluated the GE specified transient cycles and conservatively grouped those that had significant effects into simplified bounding load cases. The resulting usage factors are provided in Table 4.6-2 below.

As shown on UFSAR Figure 3.6A-33, the guard pipe assemblies utilize bellows. Calculations were identified for the bellows on the guard pipe assemblies that analyzed a large number of cycles of flexure due to normal operation and earthquakes and are therefore considered TLAAs. The number of analyzed cycles for the guard pipe bellows is significantly higher than the total number of cycles projected for the period of extended operation in Table 4.3-1.

As shown on UFSAR Figure 9.1-15 and described in UFSAR Section 9.1.4.2.3.11, the GGNS fuel transfer tube also uses bellows. A calculation was identified for the bellows on the transfer tube that analyzed a large number of cycles of flexure due to normal operation or earthquakes and is therefore considered a TLAA. The number of analyzed cycles for the transfer tube bellows is significantly higher than the total number of cycles projected for the period of extended operation in Table 4.3-1.

GGNS will manage the aging effects due to fatigue of these penetrations using the Fatigue Monitoring Program in accordance with 10 CFR 54.21(1)(c)(iii). The GGNS Fatigue Monitoring Program monitors transient cycles that contribute to fatigue usage and is further described in Appendix B.

Table 4.6-2
Usage Factors for Flued Head Penetrations on Class 1 Piping

Penetration (Penetration Number)	Usage Factor
Main steam penetrations (5–8)	0.77
MFW penetrations (9, 10)	0.35
RHR penetration (14)	0.064
RCIC steam supply penetrations (17)	0.173
Main steam drain penetration (19)	0.239
RHR/LPCI penetrations (22)	0.206
HPCS penetrations (26, 316)	0.4525
LPCS penetrations (31, 317)	0.4525
RWCU penetrations (87, 337)	0.2494
RHR/LPCI penetrations (313, 314, 315)	0.4525

4.7 OTHER PLANT-SPECIFIC TLAA

4.7.1 Erosion of the MSL Flow Restrictors

GGNS UFSAR Section 5.4.4.4 identifies for the stainless steel main steam flow restrictors, "Only very slow erosion will occur with time." The section later conservatively postulates that even with an erosion rate of 0.004 inches per year that the increase in choked flow after 40 years would be no more than 5 percent. The analysis of MSL flow restrictor erosion is evaluated as a TLAA.

Entergy Corporation evaluated the erosion-corrosion rate for the main steam flow elements. This analysis considered the specific material present in GGNS flow restrictors and determined the expected erosion-corrosion rate when operating at the velocities that would be present following EPU. The evaluation determined the expected erosion-corrosion rate would be much less than the conservative value in the UFSAR. Using this value, the expected total erosion after 60 years would remain less than the conservative total erosion value identified in the UFSAR for 40 years.

This analysis has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

4.7.2 Determination of Intermediate High Energy Line Break Locations

UFSAR Section 3.6A.2 indicates that the determination of intermediate high energy line break locations relied on an evaluation of cumulative usage factors (CUFs). As long as other stress criteria were also met, a break is not postulated at a location if the CUF is less than 0.1. Usage factors, as calculated in the design fatigue analyses, account for the design transients assumed for the original 40-year life of the plant. Therefore, the analysis of cumulative usage factors used in the selection of postulated high energy line break locations is considered a TLAA.

The Fatigue Monitoring Program will identify if the number of cycles for high energy piping systems are approaching their analyzed numbers of cycles. If the cycle limit will be exceeded, the design calculations for that system will be reviewed to determine if additional locations should be evaluated as postulated high energy line break locations or if reanalysis is required. As part of the periodic updates that consider actual plant transients, the program will ensure the usage factors for these locations where breaks were not postulated do not exceed a cumulative usage factor of 0.1. If other locations are determined to require consideration as postulated break locations, actions will be taken to address the new break locations.

Therefore, the fatigue calculations used for determining the intermediate high energy line break locations are evaluated in accordance with 10 CFR 54.21(c)(1)(iii). The Fatigue Monitoring Program will manage the associated effects of aging.

4.7.3 Fluence Effects for the Reactor Vessel Internals

The design specification 22A4052 for the reactor vessel internals components includes requirements beyond the ASME design requirements for austenitic stainless steel base metal components exposed to greater than 1×10^{21} nvt (> 1 MEV) or weld metal greater than 5×10^{20} nvt (> 1 MEV).

Entergy Corporation performed a fluence analysis of the components included in the design specification 22A4052 at EPU operating conditions for 60 years plant life (54 EFPY). Location-specific fluence levels were determined. The internal core support structure components were then evaluated against the irradiation criteria in the design specification. The results of the evaluation were that the GGNS internal core support structure components meet the design specification at EPU operating conditions for 54 EFPY.

Therefore, this analysis has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

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 Krupa, M. (Entergy) to USNRC, License Amendment Request, Extended Power Uprate, Grand Gulf Nuclear Station, Unit 1, letter GNRO-2010/00056 dated September 8, 2010.

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 NRC, "Grand Gulf Nuclear Station Unit 1, - Request for Alternative to Section 50.55A of Title 10 of the Code of Federal Regulations (10 CFR) For Examination Requirements of Category B1.11 Reactor Vessel Circumferential Welds (TAC No. MA9787)," letter GNRI-2001-00048 dated April 11, 2001.

4-11 NRC Regulatory Issue Summary 2003-09, “Environmental Qualification of Low-Voltage Instrumentation and Control Cables,” May 2, 2003.

4-12 Generic Safety Issue 168, "Environmental Qualification of Low-Voltage Instrumentation and Control Cables."

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.

APPENDIX A

UPDATED FINAL SAFETY ANALYSIS REPORT SUPPLEMENT

TABLE OF CONTENTS

A.0 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 Grand Gulf Nuclear Station (GGNS) License Renewal Application (LRA). Appendix B of the GGNS 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 GGNS 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 Grand Gulf Nuclear Station (GGNS) license renewal review (Section A.1) and time-limited aging analyses evaluated for the period of extended operation (Section A.2).

A AGING MANAGEMENT PROGRAMS AND ACTIVITIES

The GGNS 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 date of the original operating license.

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.

GGNS 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 GGNS Quality Assurance Program applies to safety-related structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished in accordance with the established GGNS 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. The corrective action, confirmation process, and administrative controls of the GGNS (10 CFR Part 50, Appendix B) Quality Assurance Program are applicable to all aging management programs and activities during the period of extended operation.

The Operating Experience Program (OEP) and the Corrective Action Program (CAP) help to assure continued effectiveness of aging management programs through evaluations of operating experience. The OEP implements the requirements of NRC NUREG-0737, Clarification of TMI Action Plan Requirements, Section I.C.5, and evaluates site, Entergy fleet, and industry operating experience for impact on GGNS. The CAP implements the requirements of 10 CFR 50, Appendix B, Criterion XVI and is used to evaluate and effect appropriate actions in response to operating experience relevant to GGNS that indicates a condition adverse to quality or a non-conformance.

A.1.1 <u>115 kV Inaccessible Transmission Cable Program</u>

The 115 kV Inaccessible Transmission Cable Program manages the effects of aging on the 115 kV inaccessible transmission cable systems. The program includes periodic actions to prevent inaccessible transmission cables from being exposed to significant moisture. In this program, inaccessible 115 kV transmission 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 may be adjusted based on test results and operating experience. The specific type of test will be 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 inspection for water after events, such as heavy rain or 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. The first cable tests and manhole inspections are to be completed prior to the period of extended operation.

A.1.2 <u>Aboveground Metallic Tanks Program</u>

The Aboveground Metallic Tanks Program manages loss of material for the outer surfaces, ncluding the bottom surfaces, of above ground metallic tanks constructed on concrete or soil, using periodic visual inspections, measurements of the thickness of the tank bottoms, and preventive measures such as protective coatings and sealants.

This program will be implemented prior to the period of extended operation.

A.1.3 Bolting Integrity Program

The Bolting Integrity Program manages loss of preload, cracking, and loss of material for closure bolting for pressure-retaining components using preventive and inspection activities. Applicable industry standards and guidance documents such as NUREG-1339, EPRI NP-5769, and EPRI TR-104213 are used to delineate the program.

The Bolting Integrity Program will be enhanced as follows.

- Clarify prohibition on use of lubricants containing molybdenum disulfide (MoS_2) for bolting and specify that proper gasket compression will be visually verified following assembly. The scope of this enhancement will include applicable GGNS site procedures.

- Include consideration of the guidance applicable for pressure boundary bolting in NUREG-1339, EPRI NP-5769, and EPRI TR-104213.

- Include volumetric examination per ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1, for high-strength closure bolting regardless of code classification. High-strength closure bolting is that with an actual yield strength greater than or equal to 150 ksi.

- Include guidance from EPRI NP-5769 and EPRI TR-104213 for replacement of bolting.

Enhancements will be implemented prior to the period of extended operation.

A.1.4 Boraflex Monitoring Program

The Boraflex Monitoring Program manages the change in material properties (neutron-absorbing capacity) in the Boraflex material affixed to spent fuel racks using silica sampling, areal testing activities, and other monitoring activities. Inspection frequency and acceptance criteria are based on the GGNS response to NRC Generic Letter 96-04 and the GGNS technical specifications.

The Boraflex Monitoring Program will be enhanced as follows.

- GGNS will perform periodic surveillances of the Boraflex neutron absorbing material on at least a five-year frequency using Boron-10 Areal Density Gage for Evaluating Racks (BADGER) testing.

  RACKLIFE analysis will continue to be performed each cycle. This analysis will include a comparison of the RACKLIFE predicted silica to the plant measured silica. This comparison will determine if adjustments to the RACKLIFE loss coefficient are merited. The analysis will include projections to the next planned RACKLIFE analysis date to ensure current Region I storage locations will not need to be reclassified as Region II storage locations in the analysis interval.

Enhancements will be implemented prior to the period of extended operation.

A.1.5 Buried Piping and Tanks Inspection Program

The Buried Piping and Tanks Inspection Program manages loss of material for the external surfaces of buried and underground piping and tanks composed of any material through preventive, mitigative, and inspection activities.

This program will be implemented prior to the period of extended operation.

A.1.6 BWR CRD Return Line Nozzle Program

The BWR Control Rod Drive (CRD) Return Line Nozzle Program manages cracking on the intended function of the control rod drive return line nozzle using preventive, mitigative, and inservice inspection activities in accordance with GGNS commitments to Generic Letter 80-095 to implement the recommendations in NUREG-0619.

A.1.7 BWR Feedwater Nozzle Program

The BWR Feedwater Nozzle Program manages cracking of the BWR feedwater nozzles using inspection activities. This program augments the examinations specified in the ASME Code, Section XI, with the recommendation of General Electric (GE) NE-523-A71-0594 to perform periodic inspection of critical regions of the BWR feedwater nozzles.

A.1.8 BWR Penetrations Program

The BWR Penetrations Program manages cracking of BWR vessel penetrations using inspection and flaw evaluation activities. Applicable industry standards and staff-approved BWRVIP documents are used to delineate the program.

A.1.9 BWR Stress Corrosion Cracking Program

The BWR Stress Corrosion Cracking Program manages cracking of the reactor coolant pressure boundary using preventive measures, inspection, and flaw evaluation. Staff-approved BWRVIP documents and the GGNS response to NUREG-0313 Revision 2 and NRC Generic Letter 88-01 and its Supplement 1 are used to delineate the program.

A.1.10 BWR Vessel ID Attachment Welds Program

The BWR Vessel ID Attachment Welds Program manages cracking in structural welds for BWR reactor vessel internal integral attachments using inspection and flaw evaluation. Applicable industry standards and staff-approved BWRVIP documents are used to delineate the program.

A.1.11 BWR Vessel Internals Program

The BWR Vessel Internals Program manages cracking, loss of material, and reduction of fracture toughness for BWR vessel internal components using inspection and flaw evaluation. This program also provides (1) determination of the susceptibility of cast austenitic stainless steel components, (2) accounting for the synergistic effect of thermal aging and neutron irradiation, and (3) implementation of a supplemental examination program, as necessary. Applicable industry standards and staff-approved BWRVIP documents are used to delineate the program.

The BWR Vessel Internals Program will be enhanced as follows.

- The susceptibility to neutron or thermal embrittlement for reactor vessel internal components composed of CASS, X-750 alloy, precipitation-hardened (PH) martensitic stainless steel (e.g., 15-5 and 17-4 PH steel), and martensitic stainless steel (e.g., 403, 410, 431 steel) will be evaluated.

- Portions of the susceptible components determined to be limiting from the standpoint of thermal aging susceptibility, neutron fluence, and cracking susceptibility (i.e., applied stress, operating temperature, and environmental conditions) will be inspected, using an inspection technique capable of detecting the critical flaw size with adequate margin. The critical flaw size will be determined based on the service loading condition and service-degraded material properties. The initial inspection will be performed either prior to or within 5 years after entering the period of extended operation. If cracking is detected after the initial inspection, the frequency of re-inspection will be justified based on fracture toughness properties appropriate for the condition of the component. The sample size will be 100% of the accessible component population, excluding components that may be in compression during normal operations.

Enhancements will be implemented prior to the period of extended operation.

A.1.12 Compressed Air Monitoring Program

The Compressed Air Monitoring Program will be enhanced as follows.

- Apply a consideration of the guidance of ASME OM-S/G-1998, Part 17; American National Standards Institute (ANSI)/ISA-S7.0.01-1996; EPRI NP-7079; and EPRI TR-108147 to the limits specified for air system contaminants.

- Include periodic and opportunistic inspections of accessible internal surfaces of piping and components in the following compressed air systems.
  - Automatic Depressurization System (ADS) air
  - Division 1 Diesel Generator Starting Air (D1DGSA)
  - Division 2 Diesel Generator Starting Air (D2DGSA)

- Division 3 Diesel Generator Starting Air (D3DGSA), also known as the HPCS Diesel Generator
- Instrument Air (IA) - system P53

Enhancements will be implemented prior to the period of extended operation.

A.1.13 Containment Inservice Inspection – IWE Program

The Containment Inservice Inspection - IWE Program is a general visual examination that assesses the condition of the containment steel liner and detects evidence of degradation that may affect structural integrity or leak tightness. This examination satisfies the requirements of the ASME Boiler and Pressure Vessel Code (to include the 1998 edition with 1999 and 2000 addenda, 2001 edition with 2003 addenda, and the 2004 Code Edition), Section XI, Subsection IWE Examination Category E-A.

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 is appropriate for the intended purpose. These procedures reference guidance contained in EPRI TR-104213, NUREG-1339 and EPRI NP-5769 to ensure proper specification of bolting material, lubricant, and installation torque.

A.1.14 Containment Inservice Inspection – IWL Program

The Containment Inservice Inspection – IWL Program is a general visual examinations that assesses the overall condition of the containment concrete and detects evidence of degradation that may affect structural integrity or leak tightness. These examinations are used to meet the examination requirements of the ASME Boiler and Pressure Vessel Code (1998 Edition with the 2000 Addenda, 2001 Edition through the 2003 Addenda, and 2004 Edition) Section XI, Subsection IWL Examination Category L-A, Item Numbers L1.11, L1.12, and L2.30. In accordance with GGNS specific relief requests, these examinations are also used as an alternative to the examinations specified in the 1992 edition with 1992 addenda for IWL Examination Category L-A.

A.1.15 Containment Leak Rate Program

The Containment Leak Rate Program provides for detection of loss of material, cracking, and loss of function 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 primary containment pressure boundary access points.

Containment leakage rate tests (LRT) are performed to assure that leakage through the containment and systems and components penetrating primary containment does not exceed allowable leakage limits specified in the plant technical specifications. An integrated leak rate test (ILRT) is performed during a period of reactor shutdown at the frequency specified in 10 CFR

Part 50, Appendix J, Option B. Performance of the integrated leak rate test per 10 CFR Part 50, Appendix J demonstrates the leak-tightness and structural integrity of the containment. Local leak rate tests (LLRT) are performed on isolation valves and containment access penetrations at frequencies that comply with the requirements of 10 CFR Part 50, Appendix J, Option B.

A.1.16 Diesel Fuel Monitoring Program

The Diesel Fuel Monitoring Program manages loss of material and fouling in piping and components exposed to an environment of diesel fuel oil by verifying the quality of fuel oil and controlling fuel oil contamination as well as periodic draining, cleaning, and inspection of tanks. Applicable industry standards and guidance documents are used to delineate the program.

The One-Time Inspection Program 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.

- Include a ten-year periodic cleaning and internal inspection of the fire water pump diesel fuel oil tanks (SP64A002A/B), the diesel fuel oil day tanks for Divisions I, II, III, and the diesel fuel oil drip tanks for Divisions I, II. These cleanings and internal inspections will be performed at least once during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals. If visual inspection is not possible, a volumetric inspection will be performed.

- Include a volumetric examination of affected areas of the diesel fuel tanks if evidence of degradation is observed during visual inspection. The scope of this enhancement includes the diesel fuel oil day tanks (Divisions I, II, III), the diesel fuel oil storage tanks (Divisions I, II, III), the diesel fuel oil drip tanks (Divisions I, II), and the diesel fire pump fuel oil storage tanks, and is applicable to the inspections performed during the 10-year period prior to the period of extended operation and at succeeding 10-year intervals.

Enhancements will be implemented prior to the period of extended operation.

A.1.17 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.1.18 External Surfaces Monitoring Program

The External Surfaces Monitoring Program manages aging effects through visual inspection of external surfaces for evidence of loss of material, cracking and change in material properties. Physical manipulation to detect hardening or loss of strength for elastomers and polymers is also used.

The External Surfaces Monitoring Program will be enhanced as follows.

- Include instructions for monitoring aging effects for flexible polymeric components through manual or physical manipulation of the material, with a sample size for manipulation of at least 10 percent of available surface area.
- Clearly identify underground components within the scope of this program in program documents. Underground components are those for which access is physically restricted.
- Provide instructions for inspecting all underground components within the scope of this program during each 5-year period, beginning 10 years prior to the entry into the period of extended operation.

Enhancements will be implemented prior to the period of extended operation.

A.1.19 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, and (c) assessing the impact of the reactor coolant environment on a set of sample critical components.

The Fatigue Monitoring Program will be enhanced as follows.

- A review of the GGNS high energy line break analyses and the corresponding tracking of associated cumulative usage factors will be performed to ensure that the GGNS program adequately manages fatigue usage for these locations.
- 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 using the formulae sets listed in Section A.2.2.3.

- Program guidance documents will be revised 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.1.20 Fire Protection Program

The Fire Protection Program manages cracking, loss of material, and change in material properties through visual inspection of components and structures with a fire barrier intended function. It also manages loss of material for the CO_2 and Halon fire suppression systems through periodic visual inspection and testing.

The Fire Protection Program will be enhanced as follows.

- Require visual inspections of the Halon/CO_2 fire suppression system at least once every fuel cycle to examine for signs of corrosion.

- Require visual inspections of fire damper framing at least once every fuel cycle to check for signs of degradation.

- Require visual inspections of concrete curbs, manways, hatches, manhole covers, hatch covers, and roof slabs at least once every fuel cycle to confirm that aging effects are not occurring.

Enhancements will be implemented prior to the period of extended operation.

A.1.21 Fire Water System Program

The Fire Water System Program manages loss of material and fouling for components in fire protection systems using preventive, inspection, and monitoring activities, including periodic full-flow flush test and testing or replacement of sprinkler heads. Applicable industry standards and guidance documents are used to delineate the program.

The Fire Water System Program will be enhanced as follows.

- Include periodic visual inspection of spray and sprinkler system internals for evidence of degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation.

- Include periodic inspection of hose reels for degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation.

- Include one of the following options.

  (1) 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.

  OR

  (2) A visual inspection of the internal surface of fire protection piping will be performed upon each entry to the system for routine or corrective maintenance. These inspections will be capable of evaluating (a) wall thickness to ensure against catastrophic failure and (b) 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% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Additional inspections will performed as needed to obtain this representative sample prior to the period of extended operation.

- Include a visual inspection of a representative number of locations on the interior surface of below grade fire protection piping at a frequency of at least once every 10 years during the period of extended operation. A representative number is 20% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Acceptance criteria will be no unacceptable degradation.

- A representative sample of sprinkler heads will be tested or replaced before the end of the 50-year sprinkler head service life and at 10-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 4 sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater.

Enhancements will be implemented prior to the period of extended operation.

A.1.22 Flow-Accelerated Corrosion Program

The Flow-Accelerated Corrosion (FAC) Program manages loss of material due to wall thinning for piping and components by conducting appropriate analysis and baseline inspections, determining the extent of thinning, performing follow-up inspections, and taking corrective actions as necessary. The program follows guidelines published by EPRI in NSAC-202L.

The FAC Program will be enhanced as follows.

- Revise program documentation to specify that downstream components are monitored closely to mitigate any increased wear when susceptible upstream components are replaced with resistant materials, such as high chromium material.

This enhancement will be implemented prior to the period of extended operation.

A.1.23 Inservice Inspection Program

The Inservice Inspection Program manages aging effects 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, or visual examination as specified in ASME Section XI code. 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.

A.1.24 Inservice Inspection – IWF Program

The Inservice Inspection – IWF Program manages aging effects for ASME Class 1, 2, 3 piping and component supports. The 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 Inservice Inspection – IWF Program will be enhanced as follows.

- Address inspections of accessible sliding surfaces.

- Clarify that parameters monitored or inspected will include corrosion; deformation; misalignment of supports; missing, detached, or loosened support items; improper clearances of guides and stops; and improper hot or cold settings of spring supports and constant load supports. Accessible areas of sliding surfaces will be monitored for debris, dirt, or indications of excessive loss of material due to wear that could prevent or restrict sliding as intended in the design basis of the support. Structural bolts will be monitored for corrosion and loss of integrity of bolted connections due to self-loosening and material conditions that can affect structural integrity. High-strength structural bolting (actual measured yield strength greater than or equal to 150 ksi or 1,034 MPa in sizes greater than 1 inch nominal diameter) susceptible to stress corrosion cracking (SCC) will be monitored for SCC.

- Clarify that detection of aging will include:
  a) Monitoring structural bolting (ASTM A-325, ASTM F1852, and ASTM A490 bolts) and anchor bolts will be monitored for loss of material, loose or missing nuts, loss of pre-load and cracking of concrete around the anchor bolts.

   b) Volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 should be performed for high strength structural bolting to detect cracking in addition to the VT-3 examination. This volumetric examination may be waived with adequate plant-specific justification

- Include the following as unacceptable conditions.
   a) Loss of material due to corrosion or wear, which reduces the load bearing capacity of the component support.
   b) Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support.
   c) Cracked or sheared bolts, including high strength bolts, and anchors.

Enhancements will be implemented prior to the period of extended operation.

A.1.25 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 consists of periodic inspections and preventive maintenance to manage loss of material for cranes and hoists, based on applicable industry standards and guidance documents. 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.

- The scope will include monitoring of rails in the rail system for the aging effect wear and structural connections/bolting for loose or missing bolts, nuts, pins or rivets. Additionally, include visual inspection of structural components and structural bolts for loss of material due to various mechanisms and structural bolting for loss of preload due to self-loosening.

- Revise acceptance criteria to state that any significant loss of material for structural components and structural bolts and significant wear of rails in the rail system is evaluated according to ASME B30.2 or other applicable industry standard in the ASME B30 series.

Enhancements will be implemented prior to the period of extended operation.

A.1.26 Internal Surfaces in Miscellaneous Piping and Ducting Components Program

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program manages the effects of aging using visual inspections of the internal surfaces of piping and components during periodic surveillances or maintenance activities when the surfaces are accessible for visual inspection. Physical manipulation or pressurization to detect hardening or loss of strength for elastomers and polymers is also used.

This program will be implemented prior to the period of extended operation.

A.1.27 Masonry Wall Program

The Masonry Wall Program manages aging effects for each masonry wall within the scope of license renewal. The program includes visual inspection of masonry walls including 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 of masonry walls are managed by the Structures Monitoring Program. Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections.

The Masonry Wall Program will be enhanced as follows.

- Monitor gaps between the supports and masonry walls that could potentially affect wall qualification.
- Require masonry walls to be inspected every five years unless technical justification is provided to extend the inspection to a period not to exceed ten years.

Enhancements will be implemented prior to the period of extended operation.

A.1.28 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 quantitative 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.

This program will be completed prior to the period of extended operation.

A.1.29 Non-EQ Inaccessible Power Cables (400 V to 35 kV) Program

The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program manages the aging effects on the inaccessible power (400 V to 35kV) cable systems. The program includes periodic actions to prevent inaccessible cables from being exposed to significant moisture. In this program, inaccessible power (400 V to 35kV) 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 inspection for water after events such as heavy rain or flooding will be performed. Inspection frequency will be increased as necessary based on evaluation of inspection results.

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) Program will be enhanced as follows.

- Include low-voltage (400 V to 2 kV) power cables.
- Condition-based inspections of manholes not automatically dewatered by a sump pump will be performed following periods of heavy rain or potentially high water table conditions, as indicated by river level.
- Clarify that the manhole inspections will include direct observation that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and verification that dewatering/drainage systems (i.e., sump pumps) and associated alarms if applicable operate properly.

Enhancements will be implemented prior to the period of extended operation, and the first cable tests and manhole inspections will be completed prior to the period of extended operation.

A.1.30 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 assures 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 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 (such as insulation resistance tests or time domain reflectometry) 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.1.31 Non-EQ Insulated Cables and Connections Program

The Non-EQ Insulated Cables and Connections Program assures 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.

A representative sample consisting of 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, and 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.1.32 Oil Analysis Program

The Oil Analysis Program ensures that loss of material, cracking, and fouling are not occurring by maintaining oil environments free of contaminants (primarily water and particulates). Testing activities include sampling and analysis of lubricating oil.

The One-Time Inspection Program utilizes inspections or non-destructive evaluations of representative samples to verify that the Oil Analysis Program has been effective at managing aging effects.

The Oil Analysis Program will be enhanced as follows.

- Include piping and components within the main generator system (N41) with an internal environment of lube oil.

- Provide a formalized analysis technique for particulate counting.

Enhancements will be implemented prior to the period of extended operation.

A.1.33 One-Time Inspection Program

The One-Time Inspection Program consists of a one-time inspection of selected components to accomplish one of the following:

- Verify the effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the period of extended operation.
- Confirm the insignificance of an aging effect for situations in which additional confirmation is appropriate.

Inspections that verify unacceptable degradation is not occurring will be used.

The sample size of components to be inspected will be based on an assessment of materials, environment, aging effects, and 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.

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	One-time inspection activity will verify the effectiveness of the diesel fuel monitoring aging management programs by confirming that unacceptable loss of material is not occurring.

Oil analysis program	One-time inspection activity will verify the effectiveness of the oil analysis aging management programs by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Water chemistry control program	One-time inspection activity will verify the effectiveness of the water chemistry control – BWR aging management program by confirming that unacceptable cracking, loss of material, and fouling is not occurring.

The inspection will be performed within the ten years prior to the period of extended operation.

A.1.34 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.

This program provides a one-time volumetric inspection of a sample of these Class 1 piping locations that are susceptible to cracking. The program includes pipes, fittings, branch connections, and all full and partial penetration (socket) welds.

This program includes a statistically significant sampling approach. Sample selection is based on susceptibility to stress corrosion, cyclic loading (including thermal, mechanical, and vibration fatigue), or thermal stratification and thermal turbulence.

The program includes measures to verify that degradation is not occurring, thereby either confirming that there is no need to manage aging-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.1.35 Periodic Surveillance and Preventive Maintenance Program

The Periodic Surveillance and Preventive Maintenance Program manages aging effects not managed by other aging management programs, including loss of material, cracking, and change in material properties.

Credit for program activities has been taken in the aging management review of the following systems and structures.

- Gasket/seal for upper containment pool gates in containment building.
- Low pressure core spray system (LPCS) piping passing through the waterline region of suppression pool.
- Residual heat removal (RHR) system piping passing through the waterline region of suppression pool.
- Pressure relief system piping passing through the waterline region of the suppression pool.
- Reactor core isolation cooling (RCIC) system piping passing through the waterline region of the suppression pool.
- Control rod drive (CRD) system piping.
- Circulating water system piping and valve bodies.
- Floor and equipment drain system piping, drain housings, and valve bodies.
- High pressure core spray (HPCS) system piping passing through the waterline region of the suppression pool.
- Floor and equipment drain system piping below the waterline in the in-scope sumps.

The Periodic Surveillance and Preventive Maintenance Program will be enhanced as follows.

- Revise program guidance documents 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.1.36 Protective Coating Monitoring and Maintenance Program

The Protective Coating Monitoring and Maintenance Program monitors and maintains service level I coatings inside containment. The program assesses coating condition through visual inspections.

The Protective Coating Monitoring and Maintenance Program will be enhanced as follows.

- Revise program documents to include parameters monitored or inspected per the guidance provided in ASTM D5163-08.

- Revise program documents to provide for inspection of coatings near sumps or screens associated with the emergency core cooling system.

- Revise program documents to include acceptance criteria per ASTM D 5163-08.

Enhancements will be implemented prior to the period of extended operation.

A.1.37 Reactor Head Closure Studs Program

The Reactor Head Closure Studs Program manages cracking and loss of material for reactor head closure stud bolting using inservice inspection and preventive measures. ASME Section XI examination and inspection requirements specified in Table IWB-2500-1 are used. The program also relies on recommendations to address reactor head closure stud bolting degradation listed in NUREG-1339 and NRC Regulatory Guide 1.65.

A.1.38 Reactor Vessel Surveillance Program

The Reactor Vessel Surveillance Program manages reduction of fracture toughness 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 10CFR50, Appendix H for vessel material surveillance. An integrated surveillance program based on staff-approved BWRVIP documents (including BWRVIP-86-A, BWRVIP-102, BWRVIP-135) has been approved for use by NRC.

The Reactor Vessel Surveillance Maintenance Program will be enhanced as follows.

- Ensure that the additional requirements specified in the final NRC safety evaluation for BWRVIP-86 Revision 1 will be addressed before the period of extended operation.

This enhancement will be implemented prior to the period of extended operation.

A.1.39 RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is an existing program that requires periodic monitoring 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 contains guidance on engineering data compilation, inspection activities, technical evaluation, inspection frequency, and the content of inspection reports.

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program will be enhanced as follows.

- Accessible structures will be monitored on a frequency not to exceed five years, consistent with the frequency for implementing the requirements of RG 1.127.
- Perform periodic sampling, testing, and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every five years.
- Include quantitative acceptance criteria for evaluation and acceptance based on the guidance provided in ACI 349.3R.

Enhancements will be implemented prior to the period of extended operation.

A.1.40 Selective Leaching Program

The Selective Leaching Program includes a one-time visual inspection of selected components coupled with hardness measurement or other mechanical examination techniques to determine whether loss of material is occurring due to selective leaching.

This inspection will be performed within the five years prior to the period of extended operation.

A.1.41 Service Water Integrity Program

The Service Water Integrity Program manages loss of material and fouling in open-cycle cooling water systems as described in the GGNS response to NRC GL 89-13.

A.1.42 Structures Monitoring Program

The Structures Monitoring Program manages the effects of aging on structures and structural components, including structural bolting, within the scope of license renewal. The program was developed based on guidance in 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 Structures Monitoring Program will be enhanced as follows.

- Clarify that the scope includes the following in-scope structures and structural components.
  - Containment Building (GGN 2)
  - Control House - Switchyard

- Culvert No. 1 and drainage channel
- Manholes and duct banks
- Radioactive waste building pipe tunnel

- Clarify that the scope includes the following in-scope structural components.

  - Anchor bolts
  - Anchorage / embedments
  - Base plates
  - Basin debris screen and grating
  - Battery racks
  - Beams, columns, floor slabs and interior walls
  - Cable tray and cable tray supports
  - Component and piping supports
  - Conduit and conduit supports
  - Containment sump liner and penetrations
  - Containment sump structures
  - Control room ceiling support system
  - Cooling tower drift eliminators
  - Cooling tower fill
  - CST/RWST retaining basin (wall)
  - Diesel fuel tank access tunnel slab
  - Drainage channel
  - Drywell floor slab (concrete)
  - Drywell wall (concrete)
  - Duct banks
  - Electrical and instrument panels and enclosures
  - Equipment pads/foundations
  - Exterior walls
  - Fan stack grating
  - Fire proofing
  - Flood curbs
  - Flood retention materials (spare parts)
  - Flood, pressure and specialty doors
  - Floor slab
  - Foundations
  - HVAC duct supports
  - Instrument line supports
  - Instrument racks, frames and tubing trays
  - Interior walls
  - Main steam pipe tunnel
  - Manholes
  - Manways, hatches, manhole covers, and hatch covers
  - Metal siding

- Missile shields
- Monorails
- Penetration sealant (flood, radiation)
- Penetration sleeves (mechanical/electrical not penetrating primary containment boundary)
- Pipe whip restraints
- Pressure relief panels
- Reactor pedestal
- Reactor shield wall (steel portion)
- Roof decking
- Roof hatches
- Roof membrane
- Roof slabs
- RPV pedestal sump liner and penetrations
- Seals and gaskets (doors, manways and hatches)
- Seismic isolation joint
- Stairway, handrail, platform, grating, decking, and ladders
- Structural bolting
- Structural steel, beams, columns, and plates
- Sumps and sump liners
- Support members: welds, bolted connections, support anchorages to building structure
- Support pedestals
- Transmission towers (see Note 1)
- Upper containment pool floor and walls
- Vents and louvers

Note 1: The inspections of these structures may be performed by the transmission personnel. However, the results of the inspections will be provided to the GGNS Structures Monitoring Program owner for review.

- Clarify the term "significant degradation" to include the following: "that could lead to loss of structural integrity...."

- Include guidance to perform periodic sampling and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least once every five years.

- Include an inspection for missing nuts for the structural connections.

- Include monitoring of sliding/bearing surfaces, such as lubrite plates, for loss of material due to wear or corrosion, debris, or dirt. The program will be enhanced to include monitoring elastomeric vibration isolators and structural sealants for cracking, loss of material, and hardening.

- Include inspection requirements for vibration isolators will be enhanced to include augmented inspections by feel or touch to detect hardening, if the vibration isolation function is suspect.

- Require inspections every five years for structures and structural components within the scope of license renewal unless technical justification is provided to extend the inspection to a period not to exceed ten years.

- Prescribe acceptance criteria 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-96. 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.1.43 Water Chemistry Control – BWR Program

The Water Chemistry Control – BWR Program manages loss of material, cracking, and fouling in components exposed to a treated water environment through monitoring and control of water chemistry. EPRI water chemistry guidelines are used.

The One-Time Inspection Program utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – BWR Program has been effective at managing aging effects.

A.1.44 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, as well as visual inspections.

The Water Chemistry Control – Closed Treated Water Systems Program will be enhanced as follows.

- Provide a corrosion inhibitor for the engine jacket water on the engine-driven fire water pump diesels in accordance with industry guidelines and vendor recommendations.

- Provide periodic flushing of the engine jacket water and cleaning of heat exchanger tubes for the engine-driven fire water pump diesels in accordance with industry guidelines and vendor recommendations.

- Provide testing of the engine jacket water for the engine-driven fire water pump diesels at least once per refueling cycle.

- Conduct inspections whenever a boundary is opened for the following systems.

  - Drywell chilled water (DCW, system P72)
  - Plant chilled water (PCW, system P71)
  - Diesel generator cooling water subsystem for Division I and II standby diesel generators
  - Diesel engine jacket water for engine-driven fire water pumps
  - Diesel generator cooling water subsystem for Division III (HPCS) diesel generator
  - Turbine building cooling water (TBCW, system P43)
  - Component cooling water (CCW, system P42)

  These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, and other plant-specific inspection and personnel qualification procedures that are capable of detecting corrosion or cracking.

- Inspect a representative sample of piping and components at a frequency of once every ten years for the following systems.

  - Drywell chilled water (DCW, system P72)
  - Plant chilled water (PCW, system P71)
  - Diesel generator cooling water subsystem for Division I and II standby diesel generators
  - Diesel engine jacket water for engine-driven fire water pumps
  - Diesel generator cooling water subsystem for Division III (HPCS) diesel generator
  - Turbine building cooling water (TBCW, system P43)
  - Component cooling water (CCW, system P42)

  Components inspected will be those with the highest likelihood of corrosion or cracking. A representative sample is 20% of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. The inspection methods 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.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 have been identified and evaluated to meet this requirement.

A.2.1 Reactor Vessel Neutron Embrittlement

The reactor vessel neutron embrittlement time-limited aging analyses including consideration for extended power uprate (EPU) either have been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii) or will be managed for the period of extended operation in accordance with 10 CFR 54.24(c)(1)(iii) as summarized below.

Based on the plant operating history, a projected EFPY value of 54 EFPY is used to evaluate reactor vessel neutron embrittlement time-limited aging analyses.

A.2.1.1 Reactor Vessel Fluence

Calculated fluence is based on a time-limited assumption defined by the operating term. Therefore, analyses that evaluate reactor vessel neutron embrittlement based on calculated fluence are time-limited aging analyses.

The high-energy (> 1 MeV) neutron fluence for the nozzles, welds and shells of the reactor pressure vessel (RPV) beltline region was determined using the General Electric-Hitachi (GEH) method for neutron flux calculation documented in report NEDC-32983P-A and approved by the NRC. The method adheres to the guidance prescribed in Regulatory Guide (RG) 1.190 as was described in the EPU submittal. (Reference A.3-3).

A.2.1.2 Pressure-Temperature Limits

Appendix G of 10 CFR 50 requires that the reactor vessel remain within established pressure-temperature (P-T) limits during boltup, hydro-test, pressure tests, normal operation, and anticipated operational occurrences. These limits are calculated using materials and fluence data, including data obtained through the Reactor Vessel Surveillance Program.

The P-T limit curves will continue to be updated, as required by Appendix G of 10 CFR Part 50, assuring that limits remain valid through the period of extended operation.

The time-limited aging analyses for reactor vessel pressure-temperature limits will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.1.3 Upper-Shelf Energy

The predictions for percent drop in upper shelf energy (USE) values were projected to 54 EFPY using projected beltline fluence values, chemistry and surveillance data, and un-irradiated USE information in accordance with Regulatory Guide 1.99. All projected USE values for 54 EFPY remain above the 50 ft-lb minimum acceptable value specified in Appendix G of 10 CFR 50.

The time-limited aging analyses for upper shelf energy 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 Reactor Vessel Circumferential Weld Inspection Relief

The GGNS reactor pressure vessel circumferential weld parameters at 54 EFPY will remain within the NRC's (64 EFPY) bounding parameters from the BWRVIP-05 SER. The fact that the values projected to the end of the period of extended operation are less than the 64 EFPY value provided by the NRC leads to the conclusion that the GGNS RPV conditional failure probability is less than the conditional failure probability of the NRC analysis. As such, the conditional probability of failure for circumferential welds remains below that determined during the NRC's final safety evaluation of BWRVIP-05.

The reactor vessel circumferential weld inspection relief for the extended operating period will be submitted to the NRC in accordance with 10 CFR 50.55(a).

The time-limited aging analysis for reactor vessel circumferential weld inspection relief has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.1.5 Reactor Vessel Axial Weld Failure Probability

The NRC SER for BWRVIP-74-A evaluated the failure frequency of axially oriented welds in BWR reactor vessels. Applicants for license renewal must evaluate axially oriented RPV welds to show that their failure frequency remains below the value calculated in the BWRVIP-74 SER. The SER states that an acceptable way to do this is to show that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in the SER.

The projected 54 EFPY GGNS mean ART is less than the bounding value shown in the NRC SER for BWRVIP-74.

Reactor vessel axial weld TLAA has been projected through the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.1.6 Reactor Pressure Vessel Core Reflood Thermal Shock Analysis

General Electric Report NEDO-10029 is referenced in Section 5.3.3 of the UFSAR. NEDO-10029 addressed the concern for brittle fracture of the reactor pressure vessel due to reflood following a postulated loss of coolant accident (LOCA). In addition to the NEDO-10029 that is listed in the UFSAR, there is a more recent analysis of the BWR-6 vessels (Ranganath, S., "Fracture Mechanics Evaluation of a Boiling Water Reactor Vessel Following a Postulated Loss of Coolant Accident," Fifth International Conference on Structural Mechanics in Reactor Technology, Berlin, Germany, August 1979). The more recent analysis is appropriate for the GGNS reactor pressure vessel because it evaluates the bounding LOCA event, a main steam line break, for a BWR-6 vessel design.

This analysis shows that when the peak stress intensity occurs at approximately 300 seconds after the LOCA, the temperature inside the vessel wall is approximately 400ºF. The maximum ART value calculated for the GGNS RPV beltline material is 53ºF. Using the equation for K_{IC} presented in Appendix A of ASME Section XI and the maximum ART value, the material reaches upper shelf at approximately158ºF, which is well below the minimum 400ºF temperature predicted for the thermal shock event at the time of peak stress intensity. Therefore, the revised analysis has projected the TLAA through the period of extended operation. The time-limited aging analysis for Reactor Pressure Vessel Core Reflood Thermal Shock Analysis has been projected to the end of the period of extended operation in accordance with 10 CFR 54.21(c)(1)(ii).

A.2.2 Metal Fatigue

A.2.2.1 Class 1 Metal Fatigue

Fatigue evaluations were performed in the design of the GGNS Class 1 components in accordance with their design requirements. ASME Section III fatigue evaluations are contained in analyses and stress reports, and because they may be based on a number of transient cycles assumed for a 40-year operating term, these evaluations are considered time-limited aging analyses.

Design cyclic loadings and thermal conditions for the Class 1 components are defined by the applicable design specifications for each component. The original design specifications provided a set of transients that were used in the design of the components and are included as part of each component analysis or stress report.

The Fatigue Monitoring Program tracks and evaluates the cycles and requires corrective actions if limits are approached.

Reactor Vessel

As described in UFSAR Section 5.3.3.3, the reactor pressure vessel is a vertical, cylindrical pressure vessel of welded construction fabricated in accordance with ASME Code, Section III, Class 1 requirements. Fatigue evaluations for the reactor vessel were performed as part of the vessel design. The fatigue analyses of the reactor vessel are considered time-limited aging analyses because they are based on numbers of design cycles that were expected to occur in 40 years of operation.

GGNS will monitor these transient cycles using the Fatigue Monitoring Program and assure that action 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 Feedwater Nozzle

As described in UFSAR Section 5.3.3.1.4.5.1, GGNS implemented a plant modification prior to plant operation to eliminate concerns identified in previous BWR designs. A second piston ring and triple thermal sleeves have been incorporated in the design for Grand Gulf.

The analysis of the modified feedwater nozzle included fatigue from potential rapid cycling behind the thermal sleeves. Therefore, for the FW nozzle there is a location-specific rapid cycling fatigue usage that added to the cycle-based fatigue. The usage is postulated based on time and feedwater temperature in order to include the rapid cycling effect.

The feedwater nozzle is one of the locations that will be reevaluated for environmental assisted fatigue, and the reanalysis will consider the effects of potential rapid cycling as necessary. This action will be completed under the Fatigue Monitoring Program. As such, the effects of fatigue on the feedwater nozzles will be managed for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Vessel Internals

A general assembly drawing of the important RPV internals components is shown in UFSAR Figure 3.9-8. Fatigue evaluations for the reactor vessel internals were performed as part of the internals design. The fatigue analyses of the reactor vessel internals are considered time-limited aging analyses because they are based on numbers of design cycles that were expected to occur in 40 years of operation. The fatigue analyses of the reactor vessel internals were reviewed during the extended power uprate.

GGNS will monitor transient cycles using the Fatigue Monitoring Program and assure that action is taken if any of the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor vessel internals in accordance with 10 CFR 54.21(c)(1)(iii).

Reactor Recirculation Pumps

UFSAR Section 3.9.1.2.1.4 describes the Byron-Jackson recirculation pump fatigue analysis. The fatigue analysis for the reactor recirculation pump casing considered the RCS fatigue transients specified by GE. The analysis justified exempting portions of the case from analysis and determined that the remaining locations met 1974 ASME Section III code fatigue requirements. Usage factors were calculated for several locations in the pump cover that were later reanalyzed due to modifications to install shaft sleeves and modify the seal water heat exchanger.

The Fatigue Monitoring Program will manage the effects of aging due to fatigue on the reactor recirculation pumps in accordance with 10 CFR 54.21(c)(1)(iii).

Control Rod Drives

The Class 1 portions of the control rod drives were analyzed for fatigue. The cumulative usage factors are low and the tracking of cycles under the Fatigue Monitoring Program ensures the fatigue on these components remains acceptable. 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)

Class 1 Piping

The piping specifications for GGNS identified that the ASME Class 1 piping must be analyzed for the transient cycle drawings provided by General Electric. Detailed fatigue analyses were then generated for GGNS to analyze multiple locations on each system within the ASME Class 1 boundary. The fatigue analyses of the Class 1 piping are considered time-limited aging analyses because they are based on numbers of design cycles that were expected to occur in 40 years of operation. GGNS will monitor the cycles actually incurred compared to the cycles analyzed using the Fatigue Monitoring Program and assure that action is taken if the actual cycles approach their analyzed numbers. As such, the Fatigue Monitoring Program will manage the effects of aging due to fatigue on the ASME Section III piping in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.2.2 Non-Class 1 Metal Fatigue

The design of ASME III Code Class 2 and 3 piping systems incorporates the Code stress reduction factor for determining acceptability of piping design with respect to thermal stresses. In general, 7000 thermal cycles are assumed, allowing a stress reduction factor of 1.0 in the stress analyses. GGNS evaluated the validity of this assumption for 60 years of plant operation. The results of this evaluation indicate that the 7000 thermal cycle assumption will not be exceeded for 60 years of operation. Therefore, the pipe stress calculations remain valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

Non-class 1 components other than piping system components require fatigue analyses if they were built to a section of the code such as ASME Section III, NC-3200 or ASME Section VIII, Division 2. A review of the non-Class 1 components other than piping identified non-Class 1 fatigue analysis applicable to expansion joints. Design specifications and calculations were identified for expansion joints with fatigue analyses for a bounding number of cycles, which were identified as time limited aging analyses. Evaluation of these analyses determined the number of cycles were adequate for 60 years of operation. Therefore, the non-Class 1 expansion joint TLAAs are valid for the period of extended operation in accordance with 10 CFR 54.21(c)(1)(i).

A.2.2.3 Effects of Reactor Water Environment on Fatigue Life

NUREG/CR-6260 addresses the application of environmental factors to fatigue analyses (CUFs) and identifies locations of interest for consideration of environmental effects. Section 5.6 of NUREG/CR-6260 identified the following component locations to be the most sensitive to environmental effects for newer vintage General Electric plants. These locations and the subsequent calculations are directly relevant to GGNS.

(1) Reactor vessel shell and lower head

(2) Reactor vessel feedwater nozzle

(3) Reactor recirculation piping (including inlet and outlet nozzles)

(4) Core spray line reactor vessel nozzles and associated Class 1 piping

(5) Residual heat removal nozzles and associated Class 1 piping

(6) Feedwater line Class 1 piping

To support the license renewal application GGNS performed a screening evaluation of these six locations using the guidance provided in NUREG-1801 revision 2. This screening has determined there are locations that when the current usage factor is increased to account for the environmental effects, the resulting usage is greater than 1. Prior to the period of extended operation GGNS 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). GGNS will review design basis ASME Class 1 component fatigue evaluations to determine whether the locations that have been evaluated for the effects of the reactor coolant environment on fatigue include the limiting component within the reactor coolant pressure boundary. Environmental effects on fatigue for these critical components may be evaluated using one of the following sets of formulae:

Carbon and Low Alloy Steels

- Those provided in NUREG/CR-6583, using the applicable ASME Section III fatigue design curve.
- Those provided in Appendix A of NUREG/CR-6909, using either the applicable ASME Section III fatigue design curve or the fatigue design curve for carbon and low alloy steel provided in NUREG/CR-6909 (Figures A.1 and A.2, respectively, and Table A.1).
- A staff-approved alternative.

Austenitic Stainless Steels

- Those provided in NUREG/CR-5704, using the applicable ASME Section III fatigue design curve.

- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).
- A staff-approved alternative.

Nickel Alloys

- Those provided in NUREG/CR-6909, using the fatigue design curve for austenitic stainless steel provided in NUREG/CR-6909 (Figure A.3 and Table A.2).
- A staff-approved alternative.

If an acceptable CUF cannot be calculated, GGNS will repair or replace the affected locations before exceeding an environmentally adjusted CUF of 1.0.

GGNS 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).

A.2.3 Environmental Qualification of Electrical Components

The GGNS Environmental Qualification (EQ) of Electric Components Program implements the requirements of 10 CFR 50.49 (as further defined by the Division of Operating Reactors Guidelines, NUREG-0588, and Reg. Guide 1.89). The program requires action before individual components exceed their qualified life. In accordance with 10 CFR 54.21(c)(1)(iii), implementation of the EQ Program provides reasonable assurance that the effects of aging on components associated with EQ time-limited aging analyses will be adequately managed such that the intended functions can be maintained for the period of extended operation.

A.2.4 Fatigue of Primary Containment, Attached Piping, and Components

Grand Gulf utilizes a BWR Mark III containment. As described in UFSAR Section 3.8.1.3, the containment was initially designed in accordance with the loads defined in GE Topical Report NEDO 11314-08 (GESSAR Appendix 3B). Additional loads initially defined in GE document 22A4365, Interim Containment Loads Report (ICLR), Rev. 2 and later defined by GE document 22A7000, Rev. 2 (GESSAR II, Appendix 3B; Grand Gulf FSAR, Appendix 6D), have been considered for the final design verification of the containment.

UFSAR Appendix 6A, Section 3BA.7.2.2.3 (page 6A-14) identifies the quenchers were designed for a conservatively high value of 18,000 cycles of fatigue.

UFSAR Section 3.8.1.4.2 identifies the analysis of the suppression pool and cylinder wall liner plate. Fatigue analysis for the suppression pool and cylinder wall liner plate was performed using subsections NE and NB of the ASME Code, Section III, Division I, 1971 Edition with Summer of 1973 Addenda.

As shown on UFSAR Figure 3.6A-33, the guard pipe assemblies utilize bellows. Calculations were identified for the bellows on the guard pipe assemblies that analyzed a large number of cycles of flexure due to normal operation and earthquakes and are therefore considered TLAAs.

As shown on UFSAR Figure 9.1-15 and described in UFSAR Section 9.1.4.2.3.11, the GGNS fuel transfer tube also uses bellows. A calculation was identified for the bellows on the transfer tube that analyzed a large number of cycles of flexure due to normal operation or earthquakes and is therefore considered a TLAA.

GGNS will monitor transient cycles using the Fatigue Monitoring Program and assure that action 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 primary containment in accordance with 10 CFR 54.21(c)(1)(iii).

A.2.5 Other Plant-Specific TLAA

A.2.5.1 Erosion of the Main Steam Line Flow Restrictors

GGNS UFSAR Section 5.4.4.4 identifies for the stainless steel main steam flow restrictors, "Only very slow erosion will occur with time." The section later postulates that even with an erosion rate of 0.004 inches per year, the increase in choked flow after 40 years would be no more than five percent. This was evaluated as a TLAA.

Entergy Corporation evaluated the erosion-corrosion rate for the main steam flow elements. This analysis considered the specific material present in GGNS flow restrictors and determined the expected erosion-corrosion rate when operating at the velocities that would be present following EPU. The evaluation determined the expected erosion-corrosion rate would be much less than the conservative value in the UFSAR. Using this value, the expected total erosion after 60 years would remain less than the conservative total erosion value identified in the UFSAR for 40 years.

This analysis has been projected through the period of extended operation in accordance with 10CFR54.21(c)(1)(ii).

A.2.5.2 Determination of Intermediate High-Energy Line Break Locations

UFSAR Section 3.6A.2 identifies for GGNS that the determinations of intermediate high-energy line break locations included an evaluation based on CUFs being less than 0.1 if other stress criteria are also met. The usage factors, as calculated in the design fatigue analyses, account for the design transients assumed for the original 40-year life of the plant. Therefore, the determination of cumulative usage factors used in the selection of postulated high-energy line break locations is considered a TLAA.

The Fatigue Monitoring Program will identify when the transients for high-energy piping systems are approaching their analyzed numbers of cycles. If the design cycles indicate the cycle limit for exceeding a CUF of 0.1 will be exceeded, the design calculations for that system will be reviewed to determine if any additional locations should be designated as postulated high-energy line breaks. If other locations are determined to require consideration as postulated break locations, actions will be taken to address the new break locations.

The determination of intermediate high-energy line break locations is considered a TLAA that is dispositioned by 10 CFR 54.21(c)(1)(iii). The program that will manage this is the Fatigue Monitoring Program.

A.2.5.3 Fluence Effects for the Reactor Vessel Internals

The design specification 22A4052 for the reactor vessel internals components includes requirements beyond the ASME design requirements for austenitic stainless steel base metal components exposed to greater than 1 x 10^{21} nvt (> 1 MEV) or weld metal greater than 5 x 10^{20} nvt (> 1 MEV).

Entergy Corporation performed a fluence analysis of the components included in the design specification 22A4052 at EPU operating conditions for 60 years plant life (54 EFPY). Location-specific fluence levels were determined. The internal core support structure components were then evaluated against the irradiation criteria in the design specification. The results of the evaluation were that the GGNS internal core support structure components meet the design specification at EPU operating conditions for 54 EFPY.

Therefore, this analysis has been projected through the period of extended operation in accordance with 10CFR54.21(c)(1)(ii).

A.3 REFERENCES

A.3-1 [GGNS License Renewal Application—later]

A.3-2 [NRC SER for GGNS License Renewal—later]

A.3-3 Letter GNRO-2010/00056, from Michael Krupa, Entergy, to USNRC, License Amendment Request, Extended Power Uprate, Grand Gulf Nuclear Station, Unit 1, Dated September 8, 2010.

A.3-4 [NRC SER for GGNS EPU—later]

APPENDIX B

AGING MANAGEMENT PROGRAMS AND ACTIVITIES

TABLE OF CONTENTS

B.0 INTRODUCTION

B.0.1 OVERVIEW

The aging management review results for the integrated plant assessment of Grand Gulf Nuclear Station (GGNS) are presented in Sections 3.1 through 3.6 of this application. The programs credited in the integrated plant assessment for managing aging effects are described in this appendix.

Each aging management program described in this appendix has ten elements in accordance with the guidance in NUREG-1800 (Reference 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 (Reference 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 GGNS 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

GGNS 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. In addition, 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 GGNS (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

GGNS QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The GGNS Quality Assurance Program applies to GGNS safety-related structures and components. Corrective actions and administrative (document) control for both safety-related and nonsafety-related structures and components are accomplished in accordance with the established GGNS 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 GGNS confirmation process is consistent with NUREG-1801.

Administrative Controls

GGNS QA procedures, review and approval processes, and administrative controls are implemented in accordance with the requirements of 10 CFR Part 50, Appendix B. The GGNS Quality Assurance Program applies to GGNS 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 GGNS 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 is used at GGNS to enhance plant aging management programs. External nuclear industry operating experience is screened, evaluated, and acted on to prevent or mitigate the consequences of similar age-related degradation. External operating experience may include NRC generic communications (e.g., Generic Letters, Bulletins, Information Notices) and other documents (e.g., 10 CFR 21 Reports, Licensee Event Reports, Nonconformance Reports). Internal operating experience may include such things as event investigations, trending reports, lessons learned from in-house events, self-assessments, and the 10 CFR 50 Appendix B corrective action process.

Site procedures for the evaluation of these sources of operating experience remain in place as the site continues operation through the license renewal period. These procedures implement two existing programs that monitor, on an ongoing basis, industry and plant-specific operating experience that includes, but is not limited to, future operating experience related to the effects of aging on in-scope structures and components. These programs are the Operating Experience Program and the CAP. The evaluations completed under these two programs ensure that aging management programs continue to be effective in managing the aging effects for which they are credited.

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 GGNS programs is shown in Table B-2.

Table B-1
Aging Management Programs

Program	Section	New or Existing
115 kV Inaccessible Transmission Cable	B.1.1	new
Aboveground Metallic Tanks	B.1.2	new
Bolting Integrity	B.1.3	existing
Boraflex Monitoring	B.1.4	existing
Buried Piping and Tanks Inspection	B.1.5	new
BWR CRD Return Line Nozzle	B.1.6	existing
BWR Feedwater Nozzle	B.1.7	existing
BWR Penetrations	B.1.8	existing
BWR Stress Corrosion Cracking	B.1.9	existing
BWR Vessel ID Attachment Welds	B.1.10	existing
BWR Vessel Internals	B.1.11	existing
Compressed Air Monitoring	B.1.12	existing
Containment Inservice Inspection — IWE	B.1.13	existing
Containment Inservice Inspection — IWL	B.1.14	existing
Containment Leak Rate	B.1.15	existing
Diesel Fuel Monitoring	B.1.16	existing
Environmental Qualification (EQ) of Electric Components	B.1.17	existing
External Surfaces Monitoring	B.1.18	existing
Fatigue Monitoring	B.1.19	existing
Fire Protection	B.1.20	existing
Fire Water System	B.1.21	existing
Flow-Accelerated Corrosion	B.1.22	existing

Table B-1
Aging Management Programs (Continued)

Program	Section	New or Existing
Inservice Inspection	B.1.23	existing
Inservice Inspection–IWF	B.1.24	existing
Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems	B.1.25	existing
Internal Surfaces in Miscellaneous Piping and Ducting Components	B.1.26	new
Masonry Wall	B.1.27	existing
Non-EQ Cable Connections	B.1.28	new
Non-EQ Inaccessible Power Cable (400 V to 35 kV)	B.1.29	existing
Non-EQ Instrumentation Circuits Test Review	B.1.30	new
Non-EQ Insulated Cables and Connections	B.1.31	new
Oil Analysis	B.1.32	existing
One-Time Inspection	B.1.33	new
One-Time Inspection – Small-Bore Piping	B.1.34	new
Periodic Surveillance and Preventive Maintenance	B.1.35	existing
Protective Coating Monitoring and Maintenance	B.1.36	existing
Reactor Head Closure Studs	B.1.37	existing
Reactor Vessel Surveillance	B.1.38	existing
RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants	B.1.39	existing
Selective Leaching	B.1.40	new
Service Water Integrity	B.1.41	existing
Structures Monitoring	B.1.42	existing
Water Chemistry Control – BWR	B.1.43	existing

Table B-1
Aging Management Programs (Continued)

Program	Section	New or Existing
Water Chemistry Control – Closed Treated Water Systems	B.1.44	existing

B.0.6 CORRELATION WITH NUREG-1801 AGING MANAGEMENT PROGRAMS

The correlation between NUREG-1801 programs and GGNS programs is shown below. For the GGNS programs, links to appropriate sections of this appendix are provided.

Table B-2
GGNS AMP Correlation with NUREG-1801 Programs

NUREG-1801 Number	NUREG-1801 Program	GGNS Program
X.E1	Environmental Qualification (EQ) of Electric Components	Environmental Qualification (EQ) of Electric Components [B.1.17]
X.M1	Fatigue Monitoring	Fatigue Monitoring [B.1.19]
X.S1	Concrete Containment Tendon Prestress	GGNS does not have pre-stressed tendons in the containment structure. This NUREG-1801 program does not apply.
XI.M1	ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD	Inservice Inspection – ISI [B.1.23]
XI.M2	Water Chemistry	Water Chemistry Control – BWR [B.1.43]
XI.M3	Reactor Head Closure Stud Bolting	Reactor Head Closure Studs [B.1.37]
XI.M4	BWR Vessel ID Attachment Welds	BWR Vessel ID Attachment Welds [B.1.10]
XI.M5	BWR Feedwater Nozzle	BWR Feedwater Nozzle [B.1.7]
XI.M6	BWR Control Rod Drive Return Line Nozzle	BWR CRD Return Line Nozzle [B.1.6]

Table B-2
GGNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	GGNS Program
XI.M7	BWR Stress Corrosion Cracking	BWR Stress Corrosion Cracking [B.1.9]
XI.M8	BWR Penetrations	BWR Penetrations [B.1.8]
XI.M9	BWR Vessel Internals	BWR Vessel Internals [B.1.11]
XI.M10	Boric Acid Corrosion	GGNS is a BWR. This NUREG-1801 program does not apply.
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)	GGNS is a BWR. This NUREG-1801 program does not apply.
XI.M12	Thermal Aging Embrittlement of Cast Austenitic Stainless Steel (CASS)	This NUREG-1801 program is not credited for aging management. Aging effects for CASS components susceptible to thermal aging embrittlement at GGNS are managed by BWR Vessel Internals [B.1.11]
XI.M16A	PWR Vessel Internals	GGNS is a BWR. This NUREG-1801 program does not apply.
XI.M17	Flow-Accelerated Corrosion	Flow-Accelerated Corrosion Program [B.1.22]
XI.M18	Bolting Integrity	Bolting Integrity [B.1.3]
XI.M19	Steam Generators	GGNS is a BWR. This NUREG-1801 program does not apply.
XI.M20	Open-Cycle Cooling Water System	Service Water Integrity [B.1.41]
XI.M21A	Closed Treated Water Systems	Water Chemistry Control – Closed Treated Water Systems [B.1.44]
XI.M22	Boraflex Monitoring	Boraflex Monitoring [B.1.4]

Table B-2
GGNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	GGNS Program
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.1.25].
XI.M24	Compressed Air Monitoring	Compressed Air Monitoring [B.1.12]
XI.M25	BWR Reactor Water Cleanup System	Not credited for aging management. Refer to relevant discussion in Table 3.3.1, Item 3.3.1-16.
XI.M26	Fire Protection	Fire Protection [B.1.20]
XI.M27	Fire Water System	Fire Water System [B.1.21]
XI.M29	Aboveground Metallic Tanks	Aboveground Metallic Tanks [B.1.2]
XI.M30	Fuel Oil Chemistry	Diesel Fuel Monitoring [B.1.16]
XI.M31	Reactor Vessel Surveillance	Reactor Vessel Surveillance [B.1.38]
XI.M32	One-Time Inspection	One-Time Inspection [B.1.33]
XI.M33	Selective Leaching	Selective Leaching [B.1.40]
XI.M35	One-Time Inspection of ASME Code Class 1 Small-Bore Piping	One-Time Inspection – Small-Bore Piping [B.1.34]
XI.M36	External Surfaces Monitoring of Mechanical Components	External Surfaces Monitoring [B.1.18]
XI.M37	Flux Thimble Tube Inspection	GGNS is a BWR. This NUREG-1801 program does not apply.
XI.M38	Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components	Internal Surfaces in Miscellaneous Piping and Ducting Components [B.1.26]
XI.M39	Lubricating Oil Analysis	Oil Analysis [B.1.32]

Table B-2
GGNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	GGNS Program
XI.M40	Monitoring of Neutron-Absorbing Materials Other than Boraflex	There are no neutron-absorbing materials subject to aging management review at GGNS other than Boraflex. This NUREG-1801 program does not apply.
XI.M41	Buried and Underground Piping and Tanks	Buried Piping and Tanks Inspection [B.1.5]
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.1.31]
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.1.30]
XI.E3	Inaccessible Power Cables Not Subject to 10 CFR 50.49 Environmental Qualification Requirements	Non-EQ Inaccessible Power Cables (400V to 35 kV) [B.1.29]
XI.E4	Metal Enclosed Bus	GGNS has no metal enclosed bus subject to aging management review. This NUREG-1801 program does not apply.
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.1.28]

Table B-2
GGNS AMP Correlation with NUREG-1801 Programs (Continued)

NUREG-1801 Number	NUREG-1801 Program	GGNS Program
XI.S1	ASME Section XI, Subsection IWE	Containment Inservice Inspection — IWE [B.1.13]
XI.S2	ASME Section XI, Subsection IWL	Containment Inservice Inspection — IWL [B.1.14]
XI.S3	ASME Section XI, Subsection IWF	Inservice Inspection – IWF [B.1.24]
XI.S4	10 CFR 50, Appendix J	Containment Leak Rate [B.1.15]
XI.S5	Masonry Walls	Masonry Wall [B.1.27]
XI.S6	Structures Monitoring	Structures Monitoring [B.1.42]
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.1.39]
XI.S8	Protective Coating Monitoring and Maintenance Program	Protective Coating Monitoring and Maintenance Program [B.1.36]
Plant-Specific Programs		
NA	Plant-specific program	115 kV Inaccessible Transmission Cable [B.1.1]
NA	Plant-specific program	Periodic Surveillance and Preventive Maintenance [B.1.35]

Table B-3 indicates the consistency of GGNS programs with NUREG-1801 programs.

Table B-3
GGNS Program Consistency with NUREG-1801

Program Name	Plant Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
115 kV Inaccessible Transmission Cable	X			
Aboveground Metallic Tanks		X		
Bolting Integrity		X	X	
Boraflex Monitoring		X	X	
Buried Piping and Tanks Inspection		X		
BWR CRD Return Line Nozzle		X		
BWR Feedwater Nozzle		X		
BWR Penetrations		X		
BWR Stress Corrosion Cracking		X		
BWR Vessel ID Attachment Welds		X		
BWR Vessel Internals		X	X	
Compressed Air Monitoring		X	X	
Containment Inservice Inspection — IWE		X		
Containment Inservice Inspection — IWL		X		
Containment Leak Rate		X		
Diesel Fuel Monitoring		X	X	

Table B-3
GGNS Program Consistency with NUREG-1801 (Continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
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	
Inservice Inspection		X		
Inservice Inspection – IWF		X	X	
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	
Non-EQ Cable Connections		X		
Non-EQ Inaccessible Power Cables (400V to 35 kV)		X	X	
Non-EQ Instrumentation Circuits Test Review		X		
Non-EQ Insulated Cables and Connections		X		
Oil Analysis		X	X	

Table B-3
GGNS Program Consistency with NUREG-1801 (Continued)

Program Name	Plant Specific	NUREG-1801 Comparison		
		Consistent with NUREG-1801	Programs with Enhancements	Programs with Exceptions to NUREG-1801
One-Time Inspection		X		
One-Time Inspection – Small-Bore Piping		X		
Periodic Surveillance and Preventive Maintenance	X		X	
Protective Coating Monitoring and Maintenance		X	X	
Reactor Head Closure Studs				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		
Structures Monitoring		X	X	
Water Chemistry Control – BWR		X		
Water Chemistry Control – Closed Treated Water Systems		X	X	

B.1 AGING MANAGEMENT PROGRAMS AND ACTIVITIES

B.1.1 115 KV INACCESSIBLE TRANSMISSION CABLE

Program Description

There is no corresponding NUREG-1801 program.

The 115 kV Inaccessible Transmission Cable Program is a new condition monitoring program that will manage the effects of aging on the 115 kV inaccessible transmission cables. In this program, inaccessible transmission cables will be tested to provide an indication of the condition of the cable insulation properties. The specific type of test will be a proven test for detecting deterioration of the cable insulation.

This program will be implemented prior to the period of extended operation, and the first cable tests and manhole inspections are to be completed prior to the period of extended operation.

Evaluation

1. Scope of Program

This program applies to inaccessible underground (e.g., in conduit, duct banks, or direct buried) transmission cables (115 kV) within the scope of license renewal that are exposed to significant moisture. Significant moisture is defined as periodic exposure to moisture that lasts more than a few days (e.g., cable wetting or submergence in water). The following cables are included in the scope of this program:

- ESF 12 Feeder - 115 kV Switchyard to Overhead Power Pole: Phases A, B, & C (2 cables per phase)

2. Preventive Actions

This program will take periodic actions to prevent cables from being exposed to significant moisture by inspecting for water collection in cable manholes and removing water, as needed.

The inspection frequency for manholes will be established and performed based on plant-specific operating experience with cable wetting or submergence in manholes. Condition-based inspections of manholes not automatically dewatered by a sump pump will be performed based on (a) the potential for high water table conditions and (b) the occurrence of periods of heavy rain. In addition, operation of dewatering devices if applicable will be inspected and operation verified prior to any known or predicted heavy rain or flooding events.

The periodic inspection will occur at least annually. The manhole inspections will include direct observation that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and verification that dewatering/drainage systems (i.e., sump pumps) and associated alarms if applicable operate properly. If water is found during inspection (i.e., cable exposed to significant moisture), corrective actions are taken to keep the cable dry and to assess cable degradation. The first inspection for license renewal is completed prior to the period of extended operation.

3. Parameters Monitored/Inspected

Inspection for water collection in manholes will be performed based on plant-specific operating experience with water accumulation in the manhole, with the inspections to occur at least annually.

In-scope transmission cables (115 kV) that are exposed to significant moisture will be tested to provide an indication of the condition of the conductor insulation. The specific type of test performed will be determined prior to the initial test. The test will be a proven test for detecting deterioration of the insulation system due to wetting or submergence, such as dielectric loss (dissipation factor/power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state-of-the-art at the time the test is performed.

4. Detection of Aging Effects

Testing will be performed at least once every six years, with the first tests for license renewal occurring before the period of extended operation. For transmission cables exposed to significant moisture, test frequencies may be adjusted based on test results (including trending of degradation where applicable) and operating experience.

The condition of the cable insulation will be assessed with reasonable confidence using test such as dielectric loss (dissipation factor/power factor), AC voltage withstand, partial discharge, step voltage, time domain reflectometry, insulation resistance and polarization index, line resonance analysis, or other testing that is state-of-the-art at the time the tests are performed. The test used to determine the condition of the cable insulation will ensure the cables continue to meet their intended function during the period of extended operation.

5. Monitoring and Trending

Trending will be used as part of this program based on the ability of trending the test results for the specific test chosen. Since the ability to trend test results will depend on the specific type of test chosen, only results that can be trended will be used to provide additional information on the rate of cable insulation degradation.

6. Acceptance Criteria

The acceptance criteria for each test will be defined by the type of test performed and the specific cable tested. Acceptance criteria for inspections of manholes are defined by the observation that the cables and support structures are not submerged or immersed in standing water at the time of the inspection.

7. Corrective Actions

An engineering evaluation will be performed when the test acceptance criteria are not met to ensure that the intended functions of the electrical cables can be maintained consistent with the current licensing basis. When an unacceptable condition or situation is identified, a determination is made as to whether the same condition or situation is applicable to other in-scope transmission cables. Corrective actions may include, but are not limited to, installation of permanent drainage systems, installation of sump pumps and alarms, more frequent cable testing or manhole inspections, or replacement of the affected cable. When an unacceptable condition or situation is identified, the requirements of 10 CFR Part 50, Appendix B, will be used to address corrective actions.

8. Confirmation Process

This element is discussed in Section B.0.3.

9. Administrative Controls

This element is discussed in Section B.0.3.

10. Operating Experience

The 115 kV Inaccessible Transmission Cable Program is a new program. Industry operating experience was considered in the development of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to a potential aging effect for which there is no operating experience at GGNS indicating the need for an aging management program. A search of GGNS operating experience with the 115kV inaccessible transmission cables and connections in this program identified no age-related failures and no aging mechanisms not considered in NUREG-1801 have been identified. The GGNS program is similar to the program description in NUREG-1801, Section XI.E3, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the 115 kV Inaccessible Transmission Cable Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Enhancements

None

Conclusion

The 115 kV Inaccessible Transmission Cable Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The 115 kV Inaccessible Transmission Cable Program provides assurance that 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 ABOVEGROUND METALLIC TANKS

Program Description

The Aboveground Metallic Tanks Program is a new program that will manage loss of material for the outer surfaces, including the bottom surfaces, of above-ground metallic tanks constructed on concrete or soil, using periodic visual inspections, measurements of the thickness of the tank bottoms, and preventive measures such as protective coatings and sealants.

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 was considered in the development of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

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 GGNS in other programs. Visual inspections of the condensate storage tank and fire water storage tanks in 2007, 2008, and 2009 found indications of degradation which were resolved prior to any loss of intended function. As such, operating experience assures that implementation of the Aboveground Metallic Tanks Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Aboveground Metallic Tanks Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Aboveground Metallic Tanks Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.3 BOLTING INTEGRITY

Program Description

The Bolting Integrity Program is an existing program that manages loss of preload, cracking, and loss of material for closure bolting for pressure-retaining components using preventive and inspection activities. Applicable industry standards and guidance documents such as NUREG-1339, EPRI NP-5769, and EPRI TR-104213 are used to delineate the program.

NUREG-1801 Consistency

The Bolting Integrity Program, with enhancements, is 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.

Elements Affected	Enhancement
2. Preventive Actions	The Bolting Integrity Program will be enhanced to clarify the prohibition on use of lubricants containing MoS_2 for bolting and to specify that proper gasket compression will be visually verified following assembly. The scope of this enhancement will include applicable GGNS site procedures.
4. Detection of Aging Effects	The Bolting Integrity Program will be enhanced to include consideration of the guidance applicable for pressure boundary bolting in NUREG-1339, EPRI NP-5769, and EPRI TR-104213.
4. Detection of Aging Effects	The Bolting Integrity Program will be enhanced to include volumetric examination per ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1, for high-strength closure bolting regardless of code classification. High strength closure bolting is that with an actual yield strength greater than or equal to 150 ksi.

Elements Affected	Enhancement
7. Corrective Actions	The Bolting Integrity Program will be enhanced to include guidance from EPRI NP-5769 and EPRI TR-104213 for replacement of bolting.

Operating Experience

Class I bolting degradation has been observed in control rod drive (CRD) cap screws, as initially reported by General Electric. Extensive evaluations were performed to understand the degradation mechanism and its affect on cap screw integrity. Evaluation and supporting analysis concluded in 1998 that CRD cap screw degradation is caused by corrosion. Through analysis and metallurgical evaluation, the condition has been proven to be acceptable for long term operation.

Corrosion was observed in 2002 on the studs for a flange in standby service water (SSW) system piping, located in the "B" SSW basin under approximately 5 feet of water. The flange studs, nuts, and portions of the flange were observed to be covered with an iron colored deposit. When the deposit was removed from the studs and nuts on this flange, most of the protective coating was found to be deteriorated and there was noticeable metal loss from the studs. There were no signs of system leakage at this location nor were there any signs of previous leakage. The corroded flange bolts were replaced.

During an inspection of reactor recirculation pump heat exchanger studs in 2005, the presence of some light pitting and thread loss due to corrosion was reported. The studs were replaced. An inspection of the removed studs by engineering and additional mechanical maintenance personnel concluded that no loss of intended function had occurred.

While performing examinations of core spray sparger bolts in 2005, a tack weld on one bolt was found to be cracked. The tack weld is provided to prevent de-tensioning of the bolt, serving the same function as a lock wire. The remaining configuration, including another tack weld on this bolt, was found to provide an adequate locking mechanism.

A slight water leak was detected in 2006 at a bolt on the pump seal retaining ring for the high pressure core spray pump. The bolt was cleaned and retorqued.

The Bolting Integrity Program has been effective in identification of conditions and program deficiencies. Appropriate corrective actions have been implemented to correct program deficiencies and to ensure future integrity of the bolted connections. This provides assurance that the program will remain effective for managing loss of material. The history of identification of degradation and initiation of corrective action prior to loss of intended function provide assurance that the program is effective for managing aging effects for passive components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Bolting Integrity Program has been effective at managing aging effects. The Bolting Integrity Program assures 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 BORAFLEX MONITORING

Program Description

The Boraflex Monitoring Program is an existing program that manages the change in material properties (neutron-absorbing capacity) in the Boraflex material affixed to spent fuel racks using silica sampling, areal density testing, and other monitoring activities. Inspection frequency and acceptance criteria are based on the GGNS response to NRC Generic Letter 96-04 and the GGNS technical specifications.

NUREG-1801 Consistency

The Boraflex Monitoring Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M22, Boraflex Monitoring.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring and Trending	GGNS will perform periodic surveillances of the Boraflex neutron absorbing material on at least a five-year frequency using Boron-10 Areal Density Gage for Evaluating Racks (BADGER) testing. RACKLIFE analysis will continue to be performed each cycle. This analysis will include a comparison of the RACKLIFE predicted silica to the plant measured silica. This comparison will determine if adjustments to the RACKLIFE loss coefficient are merited. The analysis will include projections to the next planned RACKLIFE analysis date to ensure current Region I storage locations will not need to be reclassified as Region II storage locations in the analysis interval.

Operating Experience

The results of spent fuel storage pool neutron transmission testing in 1999 revealed boraflex gaps in the test area exceeding those assumed in the criticality safety analysis. Engineering disposition of these results was used to prohibit storage of any fuel in the spent fuel pool boraflex test area.

In-situ measurement of the boron-10 areal density of the neutron absorber material in 2007 identified no immediate actions or concerns for the spent fuel pool rack criticality safety analysis, although future limitations on the use of the spent fuel pool storage areas were indicated.

The Boraflex Monitoring Program has been effective in identification of conditions and program deficiencies. Appropriate corrective actions have been implemented. This provides assurance that the program will remain effective for managing loss of material. The history of identification of degradation and initiation of corrective action prior to loss of intended function provide assurance that the program is effective for managing aging effects for passive components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Boraflex Monitoring Program has been effective at managing aging effects. The Boraflex Monitoring Program assures 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.1.5 BURIED PIPING AND TANKS INSPECTION

Program Description

The Buried Piping and Tanks Inspection Program is a new program that manages loss of material for the external surfaces of buried and underground piping and tanks composed of any material through preventive, mitigative, and inspection activities.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Buried 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 Piping and Tanks Inspection Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

Prior to installation of a new cathodic protection system at GGNS in December of 2009, a native area potential earth current inspection was performed throughout the protected area to establish baseline readings. No degraded conditions were identified, although two areas were noted to have a higher potential for coating degradation.

The GGNS program will be based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Buried Piping and Tanks Inspection Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Buried Piping and Tanks Inspection Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Buried Piping and Tanks Inspection Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.6 BWR CRD RETURN LINE NOZZLE

Program Description

The BWR Control Rod Drive (CRD) Return Line Nozzle Program is an existing program that manages cracking of the control rod drive return line nozzle using preventive, mitigative, and inservice inspection activities, in accordance with GGNS commitments to Generic Letter 80-095 to implement the recommendations in NUREG-0619.

NUREG-1801 Consistency

The BWR CRD Return Line Nozzle Program is consistent with the program described in NUREG-1801, Section XI.M6, BWR Control Rod Drive Return Line Nozzle.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

During RF13 in 2004, the N10 nozzle was inspected using ultrasonic examination on the CRD return line nozzle end cap to carbon steel safe end dissimilar metal weld. The results revealed no crack indication. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR CRD Return Line Nozzle Program detects aging effects using nondestructive examination visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, staff-approved BWRVIP documents are based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the CRD return line nozzle 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 this program is discussed in Section B.0.4.

Conclusion

The BWR CRD Return Line Nozzle Program has been effective at managing aging effects. The BWR CRD Return Line Nozzle Program assures 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 BWR FEEDWATER NOZZLE

Program Description

The BWR Feedwater Nozzle Program is an existing program that manages cracking of the BWR feedwater nozzles using inspection activities. This program augments the examinations specified in the ASME Code, Section XI, with the recommendation of General Electric (GE) NE-523-A71-0594 to perform periodic inspection of critical regions of the BWR feedwater nozzles.

NUREG-1801 Consistency

The BWR Feedwater Nozzle Program is consistent with the program described in NUREG-1801, Section XI.M5, BWR Feedwater Nozzle.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

During RF07 in 1995, volumetric exams were performed on all six feedwater nozzle blend radii as well as on the nozzle-to-safe end welds. Non-relevant geometric reflection indication, inner diameter root geometry, and inside surface geometry were recorded on some of the blend radii and nozzle-to-safe end welds. No crack-like indications were detected. Final analysis of the ultrasonic examination data was performed and found to be acceptable in accordance with ASME Section XI.

During RF09 in 1998, volumetric exams were performed on all six feedwater nozzle blend radii as well as on two nozzle-to-safe end welds. No indications that required evaluation were recorded.

During RF12 in 2002, volumetric exams were performed on all six feedwater nozzle blend radii as well as on two nozzle-to-safe end welds. No indications that required evaluation were recorded.

The BWR Feedwater Nozzle Program detects aging effects using nondestructive examination (NDE) visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR feedwater nozzle 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 this program is discussed in Section B.0.4.

Conclusion

The BWR Feedwater Nozzle Program has been effective at managing aging effects. The BWR Feedwater Nozzle Program assures 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 BWR PENETRATIONS

Program Description

The BWR Penetrations Program is an existing program that manages cracking of BWR vessel penetrations using inspection and flaw evaluation activities. Applicable industry standards and staff-approved BWRVIP documents are used to delineate the program.

NUREG-1801 Consistency

The BWR Penetrations Program is consistent with the program described in NUREG-1801, Section XI.M8, BWR Penetrations.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Visual inspections of the instrument penetrations and extensions were performed during 1996 to 2006 with no indications of degradation noted. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR Penetrations Program detects aging effects using nondestructive examination techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, the BWRVIP programs are based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Penetrations Program 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 this program is discussed in Section B.0.4.

Conclusion

The BWR Penetrations Program has been effective at managing aging effects. The BWR Penetrations Program assures 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 BWR STRESS CORROSION CRACKING

Program Description

The BWR Stress Corrosion Cracking Program is an existing program that manages cracking of the reactor coolant pressure boundary using preventive measures, inspection, and flaw evaluation. Staff-approved BWRVIP documents and the GGNS response to NUREG-0313 Revision 2 and NRC Generic Letter 88-01 and its Supplement 1 are used to delineate the program.

NUREG-1801 Consistency

The BWR Stress Corrosion Cracking Program is consistent with the program described in NUREG-1801, Section XI.M7, BWR Stress Corrosion Cracking.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

A review of Owner's Activity Reports for 2004 through 2009 showed no indications of cracking from inspections performed under this program. Absence of aging effects indicates that the preventive actions of the program have been effective.

The BWR Stress Corrosion Cracking Program detects aging effects using NDE visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Stress Corrosion Cracking Program 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 this program is discussed in Section B.0.4.

Conclusion

The BWR Stress Corrosion Cracking Program has been effective at managing aging effects. The BWR Stress Corrosion Cracking Program assures 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 BWR VESSEL ID ATTACHMENT WELDS

Program Description

The BWR Vessel ID Attachment Welds Program is an existing program that manages cracking in structural welds for BWR reactor vessel internal integral attachments using inspection and flaw evaluation. Applicable industry standards and staff-approved BWRVIP documents are used to delineate the program.

NUREG-1801 Consistency

The BWR Vessel ID Attachment Welds Program is consistent with the program described in NUREG-1801, Section XI.M4, BWR Vessel ID Attachment Welds.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Inspection of reactor vessel internal attachment welds are governed by BWRVIP-48-A.

During RF14 in 2005, twelve jet pump wedges and six other jet pump weld locations were visually examined with no indications noted. Enhanced visual inspection was performed on twenty-four piping welds and six piping brackets with no indications noted. Visual examinations were performed on sixteen core spray brackets, and a tack weld on a bolt was identified as cracked. This condition was found to be acceptable, and the inspection interval for the bolt was revised to each refueling outage. An examination of steam dryer support and hold-down attachment welds was performed with no indications noted.

During RF15 in 2007, enhanced visual inspection was performed on four jet pump wedges and five jet pump riser brace attachment welds, and volumetric examination was performed on nineteen jet pump beams. Enhanced visual inspection of fourteen piping welds was performed. No indications were noted during these inspections.

Visual inspections of upper guide rod bracket attachment welds and surveillance sample holder bracket attachment welds have identified no indications.

The BWR Vessel ID Attachment Welds Program detects aging effects using NDE visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, BWRVIP-48-A is based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Vessel ID Attachment Welds Program 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 this program is discussed in Section B.0.4.

Conclusion

The BWR Vessel ID Attachment Welds Program has been effective at managing aging effects. The BWR Vessel ID Attachment Welds Program assures 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 BWR VESSEL INTERNALS

Program Description

The BWR Vessel Internals Program is an existing program that manages cracking, loss of material, and reduction of fracture toughness for BWR vessel internal components using inspection and flaw evaluation. This program also provides (1) determination of the susceptibility of cast austenitic stainless steel components, (2) accounting for the synergistic effect of thermal aging and neutron irradiation, and (3) implementation of a supplemental examination program, as necessary. Applicable industry standards and staff-approved BWRVIP documents are used to delineate the program.

NUREG-1801 Consistency

The BWR Vessel Internals Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M9, BWR Vessel Internals.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
4. Detection of Aging Effects	The GGNS program will be enhanced as follows. (a) The susceptibility to neutron or thermal embrittlement for reactor vessel internal components composed of CASS, X-750 alloy, precipitation-hardened (PH) martensitic stainless steel (e.g., 15-5 and 17-4 PH steel), and martensitic stainless steel (e.g., 403, 410, 431 steel) will be evaluated.

Elements Affected	Enhancements
(cont.)	(b) Portions of the susceptible components determined to be limiting from the standpoint of thermal aging susceptibility, neutron fluence, and cracking susceptibility (i.e., applied stress, operating temperature, and environmental conditions) will be inspected, using an inspection technique capable of detecting the critical flaw size with adequate margin. The critical flaw size will be determined based on the service loading condition and service-degraded material properties. The initial inspection will be performed either prior to or within 5 years after entering the period of extended operation. If cracking is detected after the initial inspection, the frequency of re-inspection will be justified based on fracture toughness properties appropriate for the condition of the component. The sample size will be 100% of the accessible component population, excluding components that may be in compression during normal operations.

Operating Experience

During RF14 in 2005, volumetric examinations of the core shroud revealed one indication on the lower side of weld H4 with characteristics associated with stress corrosion cracking. This was evaluated as acceptable and included into the core shroud re-inspection intervals. Examination results during 1995 through 2005 allowed the Grand Gulf shroud to remain classified as a category B shroud. Stress calculations and required distributed ligament evaluations were performed on those welds where greater than 50% of the circumference could not be examined. Enhanced visual inspections performed on shroud support and access hole covers in 2008 during RF16 revealed no indications. No adverse conditions have been noted.

During RF16 in 2008, visual inspection of the core spray sparger revealed no indications. Cracked tack welds at two cap screws were identified in1998 and 2005 with no further cracking noted in 2008. The locations identified with cracked tack welds were found to be acceptable.

During RF09 in 1998, GGNS began implementation of BWRVIP-42 requirements for baseline inspections of low pressure coolant injection (LPCI) coupling assemblies. These were completed with no indications or cracks identified. Further baseline inspections were completed during RF10 in 1999 and again during RF12 in 2002 with no indications or cracks identified. Inspections of LPCI coupling assemblies continued during RF13 and RF14 in 2004 and 2005 with no indications or cracks identified.

Enhanced visual inspections of control rod internal housings, control rod guide tubes, and stub tubes during RF16 in 2008 were performed with no indications noted.

Multiple inspections of incore housing, guide tubes and dry tubes have been performed, with no indications. This includes inspection of the top two feet of the SRM/IRM dry tubes. The initial dry tube inspection was accomplished during RF02 in 1987. During RF16 in 2008, twenty-four LPRM dry tubes were inspected with no indications noted.

During RF16 in 2008, jet pump assemblies were inspected with no indications of cracking, but slight wear was noted on the wedge rod at jet pumps 01, 02, 05, 06, 07, and 09. This wear was evaluated as acceptable with future inspections required. The examinations conducted to date on the jet pump assembly welds are adequate to assure the intended function of the jet pump assemblies. All jet pump beams were replaced with improved heat treated beams in response to USNRC IEB 80-07. To date no indications have been noted on the jet pump beams.

Steam dryer examinations have been performed since RF01 in 1986. During RF03 in 1989, damage was located on the lower guide and a 1/8" crack was identified on vertical bank weld V5. Reinspection of the identified crack during RF04 and RF05 in 1990 and 1992 showed no change. Several examinations were performed on various dryer components at each refueling outage beginning with RF06 in 1993 through RF14 in 2005. During RF15 in 2007, the BWRVIP-139 baseline examinations were completed on all external welds. Broken tack welds on the lifting lugs and indications on the upper support ring were identified. During RF16 in 2008, the indications noted during RF15 were inspected again. An additional indication was identified on the tack weld at 220° lifting lug and an additional indication on the upper support ring. These indications were found to be acceptable for continued operation.

The BWR Vessel Internals Program detects aging effects using NDE visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. In addition, the various BWRVIPs applied in this program are based on industry-wide experience at BWR plants. The application of these proven methods provides assurance that the effects of aging will be managed such that the BWR Vessel Internals Program 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 this program is discussed in Section B.0.4.

Conclusion

The BWR Vessel Internals Program has been effective at managing aging effects. The BWR Vessel Internals Program assures 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.1.12 COMPRESSED AIR MONITORING

Program Description

The Compressed Air Monitoring Program is an existing program that manages loss of material in compressed air systems by monitoring air samples for moisture and contaminants and by inspecting internal surfaces within compressed air systems. Inspection frequency and acceptance criteria are based on the GGNS response to NRC Generic Letter 88-14 along with applicable industry standards and guidance documents.

NUREG-1801 Consistency

The Compressed Air Monitoring Program, with enhancements, is 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.

Elements Affected	Enhancements
2. Preventive Actions	The GGNS Compressed Air Monitoring Program will be enhanced to apply a consideration of the guidance of ASME OM-S/G-1998, Part 17; American National Standards Institute (ANSI)/ISA-S7.0.01-1996; EPRI NP-7079; and EPRI TR-108147 to the limits specified for air system contaminants.
3. Parameters Monitored or Inspected 5. Monitoring and Trending	The GGNS Compressed Air Monitoring Program will be enhanced to include periodic and opportunistic inspections of accessible internal surfaces of piping and components in the following compressed air systems. • Automatic Depressurization System (ADS) air • Division 1 Diesel Generator Starting Air (D1DGSA) • Division 2 Diesel Generator Starting Air (D2DGSA) • Division 3 Diesel Generator Starting Air (D3DGSA), also known as the HPCS Diesel Generator • Instrument Air (IA) - system P53

Operating Experience

Evidence of rust was found in 2003 during internal inspection of the standby diesel generator starting air tanks. The rust did not impact the wall thickness of the tanks, and no loose products were observed. Actions were taken to remove the rust. Identification of aging effects and corrective actions prior to loss of intended function indicates that the inspection activities of the program are effective.

In 2009, a concern was identified with high dew points for diesel generator starting air systems (Division 1, 2, and 3) for the previous two years. Corrective actions included creating new repetitive tasks for maintenance on the air dryers and revising the procedure for desiccant replacement. The response to a high dew point reading now requires a check of the dryer tower crossover valves and a satisfactory dryer retest after replacement of the desiccant. This procedure ensures that the preventive actions for this program remain effective in managing aging effects.

Instrument air samples collected in 2010 exceeded the procedural limit for particulate size. The cause was attributed to filters on temporary air compressors used during RF17. A system modification was implemented to remove the temporary air compressors from the system.

Identification of program deficiencies and subsequent corrective actions provide assurance that the Compressed Air Monitoring Program will remain effective for managing loss of material of components. The application of these proven methods provides assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Compressed Air Monitoring Program has been effective at managing aging effects. The Compressed Air Monitoring Program assures 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 CONTAINMENT INSERVICE INSPECTION – IWE

Program Description

The Containment Inservice Inspection – IWE Program is an existing program that performs a general visual examination to assess the condition of the containment steel liner and to detect evidence of degradation that may affect structural integrity or leak tightness. This examination satisfies the requirements of the ASME Boiler and Pressure Vessel Code (to include the 1998 edition with 1999 and 2000 addenda, 2001 edition with 2003 addenda, and the 2004 Code Edition), Section XI, Subsection IWE Examination Category E-A.

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 is appropriate for the intended purpose. These procedures reference guidance contained in EPRI TR-104213, NUREG-1339 and EPRI NP-5769 to ensure proper specification of bolting material, lubricant, 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

During a general visual inspection of the containment liner plate in 2003, a gouge was identified. An engineering review concluded that the liner plate was still capable of performing its intended function to provide a leak tight barrier after a design basis accident. The gouge was repaired during RF13 in 2004. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

Visual examination of the containment liner in 2007 revealed flaking, blistering, peeling, and chipping conditions that were acceptable as is. Identification of degradation prior to loss of intended function provides evidence that the program is effective for managing aging effects.

Examination results for the containment liner, fuel transfer tube, and other components during RF17 in 2010 were acceptable.

The Containment Inservice Inspection – IWE Program detects aging effects using nondestructive examination visual surface techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. Identification of program deficiencies and subsequent corrective actions provide assurance that the program will remain effective for managing loss of material of components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Containment Inservice Inspection – IWE Program has been effective at managing aging effects. The Containment Inservice Inspection – IWE Program assures 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 CONTAINMENT INSERVICE INSPECTION – IWL

Program Description

The Containment Inservice Inspection – IWL Program is an existing program that performs a general visual examination to assess the overall condition of the containment concrete and to detect evidence of degradation that may affect structural integrity or leak tightness. These examinations are used to meet the examination requirements of the ASME Boiler and Pressure Vessel Code (1998 Edition with the 2000 Addenda, 2001 Edition through the 2003 Addenda, and 2004 Edition) Section XI, Subsection IWL Examination Category L-A, Item Numbers L1.11, L1.12, and L2.30. In accordance with GGNS-specific relief requests, these examinations are also used as an alternative to the examinations specified in the 1992 edition with 1992 addenda for IWL Examination Category L-A.

NUREG-1801 Consistency

The Containment Inservice Inspection – IWL Program is consistent with the program described in NUREG-1801 XI.S2, ASME Section XI, Subsection IWL.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

Inspections of concrete are performed consistent with the schedule outlined in the ISI program. A review of Owner's Activity Reports for 2004 through 2009 showed no adverse indications from these inspections.

The Containment Inservice Inspection – IWL Program detects aging effects using nondestructive examination visual surface techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components. The application of these proven methods provides assurance that the effects of aging will be managed such that components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Containment Inservice Inspection – IWL Program has been effective at managing aging effects. The Containment Inservice Inspection – IWL Program assures 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 CONTAINMENT LEAK RATE

Program Description

The Containment Leak Rate Program is an existing program that provides for detection of loss of material, cracking, and loss of function 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 primary containment pressure boundary access points.

Containment leakage rate tests (LRT) are performed to assure that leakage through the containment and systems and components penetrating primary containment does not exceed allowable leakage limits specified in the plant technical specifications. An integrated leak rate test (ILRT) is performed during a period of reactor shutdown at the frequency specified in 10 CFR Part 50, Appendix J, Option B. Performance of the integrated leak rate test per 10 CFR Part 50, Appendix J demonstrates the leak-tightness and structural integrity of the containment. Local leak rate tests (LLRT) are performed on isolation valves and containment access penetrations at frequencies that comply with 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

Local leak rate testing (LLRT) during RF10 through RF15 (1999 through 2007) met test acceptance criteria, yet some components did not meet administrative limits. Some of these components were repaired and retested as acceptable, while others were evaluated and deferred. In each of these cases, containment leakage was within overall allowed limits. This indicates that the program is effective at identifying and managing aging effects on primary containment components.

In 2006, the containment isolation valves for penetration #35 failed their LLRT with 3487 sccm leakage against an allowable limit of 3400 sccm. This identified leakage was found acceptable through engineering evaluation.

In 2007, the containment equipment hatch failed an LLRT being performed to support hatch reinstallation. Since this was not an as-found test, containment integrity was not considered to be lost. The hatch was reinstalled and the subsequent LLRT was successful.

In 2008, the LLRT on the containment isolation valves for penetration #49 for the filter/ demineralizer system indicated leakage approximately 12 times the administrative limit. A flush of the system was completed, and the valves were then re-tested satisfactorily. A new procedure was established to ensure that a system flush will be completed satisfactorily after future resin transfers.

During the containment integrated leak rate testing in 2008, test data met applicable test acceptance criteria and confirmed the structural integrity of the containment.

A program self-assessment in 2009 revealed a decline in performance due to organizational weaknesses. Follow-up actions from the 2009 self-assessment included improved data analyses and performance monitoring. Reviews against established program standards provide assurance that the program will remain effective for managing loss of material of components.

Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Containment Leak Rate Program has been effective at managing aging effects. The Containment Leak Rate Program assures 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 DIESEL FUEL MONITORING

Program Description

The Diesel Fuel Monitoring Program is an existing program that manages loss of material and fouling in piping and components exposed to an environment of diesel fuel oil by verifying the quality of fuel oil and controlling fuel oil contamination as well as periodic draining, cleaning, and inspection of tanks. Applicable industry standards and guidance documents are used to delineate the program.

The One-Time Inspection Program describes inspections planned to verify that the Diesel Fuel Monitoring Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Diesel Fuel Monitoring Program, with enhancements, is 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.

Elements Affected	Enhancements
4. Detection of Aging Effects	The Diesel Fuel Monitoring Program will be enhanced to include a ten-year periodic cleaning and internal inspection of the fire water pump diesel fuel oil tanks (SP64A002A/B), the diesel fuel oil day tanks for Divisions I, II, III, and the diesel fuel oil drip tanks for Divisions I, II. 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.

Elements Affected	Enhancements
4. Detection of Aging Effects	The Diesel Fuel Monitoring Program will be enhanced to include a volumetric examination of affected areas of the diesel fuel tanks if evidence of degradation is observed during visual inspection. The scope of this enhancement includes the diesel fuel oil day tanks (Divisions I, II, III), the diesel fuel oil storage tanks (Divisions I, II, III), the diesel fuel oil drip tanks (Divisions I, II), and the diesel fire pump fuel oil storage tanks, and is applicable to the inspections performed during the ten-year period prior to the period of extended operation and at succeeding ten-year intervals.

Operating Experience

Standby diesel fuel oil storage tank (Division I/II) inspections in 2004 indicated tank internal surfaces were satisfactory. In 2005, sampling of the fire water diesel fuel oil storage tanks indicated no signs of water or foreign material in the tanks. Absence of aging effects indicates that the preventive actions of the program have been effective.

In 2003, inspection of the high pressure core spray (HPCS Division III) diesel fuel oil storage tank indicated small blemishes in the coating. This was corrected prior to return to service.

In 2005, biotrend samples from the fire water diesel fuel oil day tanks measured biological growth on day 3 of a 6-day incubation period. Biocide addition was performed. No further actions were required in this incident. In 2007, biotrend analysis of a sample from the Division I diesel fuel oil day tank showed microbial growth. Biocide addition was performed. Routine sampling and the decisions to add biocide shows the effectiveness of the program.

Results from sampling of the fire water diesel fuel oil storage tanks during 2008 to 2010 for water and sediment were acceptable.

Results from sampling of standby diesel fuel oil storage tanks (Division I/II) and the high pressure core spray diesel fuel oil storage tank (HPCS Division III) during 2006 to 2010 for water and sediment were acceptable.

Identification of conditions and subsequent corrective actions provide assurance that the program will remain effective for managing loss of material of components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Diesel Fuel Monitoring Program has been effective at managing aging effects. The Diesel Fuel Monitoring Program assures 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 ENVIRONMENTAL QUALIFICATION (EQ) OF ELECTRIC COMPONENTS

Program Description

The Environmental Qualification (EQ) of Electric Components Program is an existing program. 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.

The GGNS EQ 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.

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

The Environmental Qualification (EQ) Program at GGNS is routinely audited to ensure that program elements are carried out properly. A program assessment in 2002 revealed no major problems. Operating experience reports were reviewed to determine EQ program impacts for GGNS. This effort indicated no 10 CFR Part 21 issues impacting the EQ program. Areas of weaknesses were addressed and follow-up actions were assigned to improve program effectiveness.

A program assessment in 2009 verified compliance with 10 CFR 50.49 and measured the effectiveness of the program by evaluating the program's overall infrastructure, records, documentation, program implementation, support personnel qualification and knowledge, and the program's impact on plant equipment. Areas of weaknesses were addressed and follow-up actions were assigned to improve program effectiveness.

Providing the proper requirements for the environmental qualification of electrical equipment important to safety, along with the identification of qualified life and specific maintenance/ installation requirements, ensures that the program will remain effective for managing aging effects.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Environmental Qualification (EQ) of Electric Components Program has been effective at managing aging effects by maintaining equipment within its qualification basis. The Environmental Qualification (EQ) of Electric Components Program assures 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 EXTERNAL SURFACES MONITORING

Program Description

The External Surfaces Monitoring Program is an existing program that manages aging effects through visual inspection of external surfaces for evidence of loss of material, cracking and change in material properties. Physical manipulation to detect hardening or loss of strength for elastomers and polymers is also used.

NUREG-1801 Consistency

The External Surfaces Monitoring Program, with enhancement, is 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.

Elements Affected	Enhancement
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 5. Monitoring	The External Surfaces Monitoring Program will be enhanced to include instructions for monitoring aging effects for flexible polymeric components through manual or physical manipulation of the material, with a sample size for manipulation of at least 10 percent of available surface area.
4. Detection of Aging Effects	The External Surfaces Monitoring Program will be enhanced as follows. 1. Underground components within the scope of this program will be clearly identified in program documents. Underground components are those for which access is physically restricted.
(cont.)	2. Instructions will be provided for inspecting all underground components within the scope of this program during each five-year period, beginning ten years prior to the entry into the period of extended operation.

Operating Experience

During a walkdown of the standby service water "A" pump house in 2009, a loss of coating was discovered on the tailpipe of a discharge safety relief valve, resulting in surface corrosion. The corrosion was determined not to affect the ability of the piping to perform its intended function. The piping was repaired using the normal work process.

During replacement of heat trace for fire water system piping in 2006, pitting corrosion was detected on the piping. The amount of pitting was determined not to threaten the integrity of the piping. The piping was repaired using the normal work process.

A build-up of scale and rust was found during inspection of a standby service water valve bonnet. The rust and scale were removed during the inspection, and the valve was found to be fully capable of performing all intended functions.

These examples of the identification of degradation and initiation of corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for passive components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The External Surfaces Monitoring Program has been effective at managing aging effects. The External Surfaces Monitoring Program assures 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 FATIGUE MONITORING

Program Description

The Fatigue Monitoring Program is an existing program that 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, and (c) assessing the impact of the reactor coolant environment on a set of sample critical components.

NUREG-1801 Consistency

The Fatigue Monitoring Program, with enhancements, is consistent with the program described in NUREG-1801, Section X.M1, Fatigue Monitoring, with one exception.

Exceptions to NUREG-1801

The Fatigue Monitoring Program is consistent with the program described in NUREG-1801, Section X.M1, Fatigue Monitoring, with the following exception.

Elements Affected	Exception
7. Corrective Actions	NUREG-1801 recommends use of a design code limit for cumulative usage factors (CUFs). GGNS applies a more stringent design limit of 0.1 CUFs at high energy line break (HELB) locations. Also, GGNS includes an additional corrective action to evaluate the HELB analysis to address a HELB exclusion location with a CUF that increases to greater than 0.1.[1]

Exception Note:

1. The use of a 0.1 limit for CUF at HELB locations is consistent with the criteria stated in UFSAR Section 3.6A.2. Evaluation of the HELB analysis is an additional valid corrective action to address HELB exclusion locations with a CUF that increases to greater than 0.1.

Enhancement

The following enhancements will be implemented at least two years prior to entering the period of extended operation.

Elements Affected	Enhancement
1. Scope of Program	A review of the GGNS high energy line break analyses and the corresponding tracking of associated cumulative usage factors will be performed to ensure that the GGNS program adequately manages fatigue usage for these locations.
1. Scope of Program	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 using the formulae sets listed in Section 4.3.3.
4. Detection of Aging Effects	The GGNS program will be enhanced to revise program documents 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

An assessment of the program in 2003 found it to be effective in collecting plant operational data required for the calculation of fatigue usage factors. Data collected and trended through 1999 confirmed that the number of cycles was not trending toward exceeding the allowable number of cycles. This program assessment included actions and recommendations to upgrade the program to enhance its effectiveness.

Analysis of an event in 2003 in which the bottom head cooldown rate limit was exceeded following a plant SCRAM indicated that calculated additional usage factors were small in magnitude. The cumulative usage factors were well within the ASME Section III Code allowable of 1.0 and therefore acceptable.

During a 2011 review of GGNS Class 1 fatigue analyses, deficiencies were identified with fatigue monitoring program activities and documentation. Additional program documentation was obtained, and further corrective actions are being completed under the corrective action program. The correction of the identified program deficiencies provides assurance that the program will be effective for managing the effects of aging due to mechanical fatigue on affected components.

A 2011 study of GGNS plant data showed that the number of plant transients to date were within their design allowable limits.

Operating experience shows that the Fatigue Monitoring Program has been effective in managing aging effects.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Fatigue Monitoring Program has been demonstrated to maintain the validity of the fatigue design basis for reactor coolant system components designed to withstand the effects of cyclic loads due to reactor system transients.

The Fatigue Monitoring Program assures the fatigue design basis is maintained such that applicable components will continue to perform their intended function consistent with the current licensing basis through the period of extended operation.

B.1.20 FIRE PROTECTION

Program Description

The Fire Protection Program is an existing program that manages cracking, loss of material, and change in material properties through visual inspection of components and structures with a fire barrier intended function. It also manages loss of material for the CO_2 and Halon fire suppression systems through periodic visual inspection and testing.

NUREG-1801 Consistency

The Fire Protection Program, with enhancements, is 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.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected 4. Detection of Aging Effects	The Fire Protection Program will be enhanced to require visual inspections of the Halon/CO_2 fire suppression system at least once every fuel cycle to examine for signs of corrosion.
4. Detection of Aging Effects	The Fire Protection Program will be enhanced to require visual inspections of fire damper framing at least once every fuel cycle to check for signs of degradation.
4. Detection of Aging Effects	The Fire Protection Program will be enhanced to require visual inspections of concrete curbs, manways, hatches, manhole covers, hatch covers, and roof slabs at least once every fuel cycle to confirm that aging effects are not occurring.

Operating Experience

In 2003, 2006, 2008, and 2010, QA audits of the Fire Protection Program were conducted. Results of these audits indicated that the program was effective in meeting intended results. The effectiveness was supported through the results of observations and documentation reviews. Specific walkdowns and inspections of fire barriers conducted in numerous areas of the plant revealed no significant issues. These audits included actions and recommendations to upgrade the program to enhance its effectiveness.

In 2004, 2005, 2006, and 2007, self-assessments were conducted. The program was assessed from a design perspective, as well as from the operational status and material condition perspective. These assessments also evaluated GGNS documentation and supporting conclusions in the Fire Hazards Analysis/Safe Shutdown Analysis. These self assessments included actions and recommendations to upgrade the program to ensure its effectiveness. Reviews against established program standards provide assurance that the program will remain effective for managing loss of material of components.

During a walkdown in 2005 to examine fireproofing material, several small pieces of fire proofing material were found to be missing on one side of a vertical steel beam. The fire proofing was repaired.

Audit Inspections were conducted in 2003 through 2010 to ensure the integrity and availability of the Halon systems and low pressure CO_2 systems. These inspections included actions and recommendations to upgrade the program to enhance its effectiveness with no significant findings or issues noted. These inspections confirm that the program is effective for managing aging effects for passive components.

In 2005 and 2008, the NRC performed triennial fire protection program inspections. Walkdowns of numerous areas of the plant to assess the material condition of fire protection features were completed with no significant findings or issues noted. These walkdowns confirm that the program is effective for managing aging effects for passive components.

Inspections in 2006, 2007, and 2010 found small tears in the door skin for three fire doors as well as rust at the bottom of a third fire door and cracks in four other fire doors. During the course of fire penetration checks in 2009, a fire barrier penetration was found to be degraded due to missing kaowool. Repairs were performed to correct these conditions.

Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Fire Protection Program has been effective at managing aging effects. The Fire Protection Program assures 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 FIRE WATER SYSTEM

Program Description

The Fire Water System Program is an existing program that manages loss of material and fouling for components in fire protection systems using preventive, inspection, and monitoring activities, including periodic full-flow flush tests and testing or replacement of sprinkler heads. Applicable industry standards and guidance documents are used to delineate the program.

NUREG-1801 Consistency

The Fire Water System Program, with enhancements, is 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.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected 6. Acceptance Criteria	The Fire Water System Program will be enhanced to include periodic visual inspection of spray and sprinkler system internals for evidence of degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation.
4. Detection of Aging Effects 6. Acceptance Criteria	The Fire Water System Program will be enhanced to include periodic inspection of hose reels for degradation. Acceptance criteria will be enhanced to verify no unacceptable degradation.

Elements Affected	Enhancements
4. Detection of Aging Effects (cont.)	The Fire Water System Program will be enhanced to include one of the following options. (1) 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. OR (2) A visual inspection of the internal surface of fire protection piping will be performed upon each entry to the system for routine or corrective maintenance. These inspections will be capable of evaluating (a) wall thickness to ensure against catastrophic failure and (b) 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% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Additional inspections will performed as needed to obtain this representative sample prior to the period of extended operation.

Elements Affected	Enhancements
4. Detection of Aging Effects 6. Acceptance Criteria	The Fire Water System Program will be enhanced to include a visual inspection of a representative number of locations on the interior surface of below grade fire protection piping at a frequency of at least once every ten years during the period of extended operation. A representative number is 20% of the population (defined as locations having the same material, environment, and aging effect combination) with a maximum of 25 locations. Acceptance criteria will be no unacceptable degradation.
4. Detection of Aging Effects	The Fire Water System Program will be enhanced to include testing or replacement of a representative sample of sprinkler heads before the end of the 50-year sprinkler head service life and at 10-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 4 sprinklers or 1 percent of the number of sprinklers per individual sprinkler sample, whichever is greater.

Operating Experience

Sprinkler systems functional tests were performed in 2004, 2006, and 2008 with no significant discrepancies noted.

Yard hydrant flow checks were performed in 2006, 2008, 2009 and 2010 with no discrepancies noted. The hydrant flow checks done in 2005 and 2007 noted a valve that was stuck closed and hose isolation valve hand wheel was broken. The valve and hand wheel were repaired and returned to service.

During a 2008 inspection, nozzle blockages were discovered in the deluge system for the main transformer. The nozzles were cleaned and inspected for debris and returned to service.

Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Fire Water System Program has been effective at managing aging effects. The Fire Water System Program assures 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.1.22 FLOW-ACCELERATED CORROSION

Program Description

The Flow-Accelerated Corrosion (FAC) Program is an existing program that manages loss of material due to wall thinning for piping and components by conducting appropriate analysis and baseline inspections, determining the extent of thinning, performing follow-up inspections, and taking corrective actions as necessary. The program follows guidelines published by EPRI in NSAC-202L.

NUREG-1801 Consistency

The FAC Program, with enhancement, is 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.

Elements Affected	Enhancement
7. Corrective Actions	The Flow-Accelerated Corrosion Program will be enhanced to revise program documentation to specify that downstream components are monitored closely to mitigate any increased wear when susceptible upstream components are replaced with resistant materials, such as high Cr material.

Operating Experience

A FAC program analysis in 2001 projected the wall thickness for a condensate system stub tube to be less than the current calculated minimum wall thickness prior to RF13 in 2004. Action was taken to replace the existing carbon steel stub tube prior to reaching this point. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

A FAC Program assessment report in 2002 concluded that the program fully met all objectives and no major problem areas or issues were identified. However, several areas for improvement were recognized. This assessment included actions and recommendations to upgrade the program and maintain its effectiveness for managing aging effects.

Evaluation of RF14 FAC wall thickness data in 2005 concluded that all items inspected were acceptable for continued service beyond RF15. A re-inspection index (projected life) was calculated for each of the items.

Evaluation of RF16 FAC wall thickness data in 2008 concluded that all items inspected were acceptable for continued service beyond RF17, with three exceptions. Condition reports were issued for each of these three items and each were repaired. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

A FAC Program assessment report in 2009 concluded that the "program health" was good. Data and analyses were found to be handled properly and in accordance with Entergy fleet procedures and industry guidelines. This assessment included actions and recommendations to upgrade the program and maintain its effectiveness for managing aging effects. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Flow-Accelerated Corrosion Program has been effective at managing aging effects. The Flow-Accelerated Corrosion Program assures 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 INSERVICE INSPECTION

Program Description

The Inservice Inspection Program is an existing program that manages aging effects 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, or visual examination as specified in ASME Section XI code. 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.

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

ISI Program summary reports between 2004 and 2010 reveal compliance (including evaluation or repair of indications/flaws) and provide evidence that the program is effective for managing aging effects in accordance with the ASME Boiler Pressure Vessel Code Section XI.

Self assessments performed in 2005, 2006, 2007, 2010 concluded that ISI program activities are being performed in accordance with ASME Section XI and Grand Gulf program requirements. From the reviews it was found that GGNS has an appropriate threshold for entering issues in the corrective action program and has taken appropriate corrective actions. Additionally, a similar review of operating experience reports identified that applicable operating experience was being effectively evaluated and implemented.

The ISI Program detects aging effects via visual, surface and ultrasonic inspection. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components. Ultrasonic inspection methods are subject to the performance demonstration requirements of ASME Section XI, Appendix VIII. In addition, the ISI programs are based on industry-wide experience.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Inservice Inspection Program has been effective at managing aging effects. The Inservice Inspection Program assures 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 INSERVICE INSPECTION – IWF

Program Description

The Inservice Inspection – IWF Program is an existing program that manages aging effects for ASME Class 1, 2, 3 and component supports. The scope of inspection for component supports is based on sampling of piping supports and 100% of component supports other than piping as specified in Table IWF-2500-1.

NUREG-1801 Consistency

The Inservice Inspection – IWF Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.S3, ASME Section XI, Subsection IWF.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program	The ISI-IWF Program will be enhanced to address inspections of accessible sliding surfaces.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected	The ISI-IWF Program will be enhanced to clarify that parameters monitored or inspected will include corrosion; deformation; misalignment of supports; missing, detached, or loosened support items; improper clearances of guides and stops; and improper hot or cold settings of spring supports and constant load supports. Accessible areas of sliding surfaces will be monitored for debris, dirt, or indications of excessive loss of material due to wear that could prevent or restrict sliding as intended in the design basis of the support. Elastomeric vibration isolation elements will be monitored for cracking, loss of material, and hardening. Structural bolts will be monitored for corrosion and loss of integrity of bolted connections due to self-loosening and material conditions that can affect structural integrity. High-strength structural bolting (actual measured yield strength greater than or equal to 150 ksi or 1,034 MPa in sizes greater than 1 inch nominal diameter) susceptible to stress corrosion cracking (SCC) will be monitored for SCC.
4. Detection of Aging Effects	The ISI-IWF Program will be enhanced to clarify that detection of aging will include the following: (a) Structural bolting (ASTM A-325, ASTM F1852, and ASTM A490 bolts) and anchor bolts will be monitored for loss of material, loose or missing nuts, loss of pre-load, and cracking of concrete around the anchor bolts. (b) Volumetric examination comparable to that of ASME Code Section XI, Table IWB-2500-1, Examination Category B-G-1 should be performed for high strength structural bolting to detect cracking in addition to the VT-3 examination. This volumetric examination may be waived with adequate plant-specific justification.

Elements Affected	Enhancements
6. Acceptance Criteria	The ISI-IWF program will be enhanced to include the following as unacceptable conditions. • Loss of material due to corrosion or wear, which reduces the load bearing capacity of the component support. • Debris, dirt, or excessive wear that could prevent or restrict sliding of the sliding surfaces as intended in the design basis of the support. • Cracked or sheared bolts, including high strength bolts, and anchors.

Operating Experience

Results of ISI examinations for pipe hanger and supports for the reactor core isolation cooling system during RF16 in 2008 were acceptable.

Results of ISI examinations for component supports for the reactor recirculation system during RF17 in 2010 were acceptable.

The Inservice Inspection – IWF Program detects aging effects using visual techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Inservice Inspection – IWF Program has been effective at managing aging effects. The Inservice Inspection – IWF Program assures 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.1.25 INSPECTION OF OVERHEAD HEAVY LOAD AND LIGHT LOAD (RELATED TO REFUELING) HANDLING SYSTEMS

Program Description

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program is an existing program that consists of periodic inspections and preventive maintenance to manage loss of material of cranes and hoists, based on applicable industry standards and guidance documents. 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.

NUREG-1801 Consistency

The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program, with enhancements, is 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.

Elements Affected	Enhancements
1. Scope of Program	The program will be enhanced to include monitoring rails in the rail system for the aging effect of wear and structural connections/bolting for loose or missing bolts, nuts, pins or rivets. Additionally, the program will be clarified to include visual inspection of structural components and structural bolts for loss of material due to various mechanisms and structural bolting for loss of preload due to self-loosening.
6. Acceptance Criteria	Acceptance criteria will be revised to state that any significant loss of material for structural components and structural bolts, and significant wear of rails in the rail system, is evaluated according to ASME B30.2 or other applicable industry standard in the ASME B30 series.

Operating Experience

During a 2008 turbine building crane inspection, the bridge girder junction bolts, the bridge cross-tie bolts and the bridge drive coupling bolts were found to be loose. Corrective actions included tightening of all bolting.

During a 2009 inspection of the polar crane rail clips, a broken stud was found at azimuth 90. The rail clips were repaired.

Identification of deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing aging effects of components.

The process for review of future plant-specific and industry operating experience for this program 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 managing aging effects. The Inspection of Overhead Heavy Load and Light Load (Related to Refueling) Handling Systems Program assures 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.1.26 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 manages the effects of aging using visual inspections of the internal surfaces of piping and components during periodic surveillances or maintenance activities when the surfaces are accessible for visual inspection. Physical manipulation or pressurization to detect hardening or loss of strength for elastomers and polymers is also used.

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 is 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 was considered in the development of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

The methods used in this program to detect aging effects are proven industry techniques that have been effectively used at GGNS in other programs. As such, operating experience assures that implementation of the Internal Surfaces in Miscellaneous Piping and Ducting Components Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Internal Surfaces in Miscellaneous Piping and Ducting Components Program will be effective for managing aging effects 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 assurance that 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 MASONRY WALL

Program Description

The Masonry Wall Program is an existing program that manages aging effects for each masonry wall within the scope of license renewal. The program includes visual inspection of masonry walls including 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 of masonry walls are managed by the Structures Monitoring Program. Masonry walls are visually examined at a frequency selected to ensure there is no loss of intended function between inspections.

NUREG-1801 Consistency

The Masonry Wall Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.S5, Masonry Wall Program.

Exceptions to NUREG-1801

None

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected	The Masonry Wall Program will be enhanced to clarify that parameters monitored or inspected will include monitoring gaps between the supports and masonry walls that could potentially affect wall qualification.
4. Detection of Aging Effects	The Masonry Wall Program will be enhanced to clarify that detection of aging effects require masonry walls to be inspected every five years unless technical justification is provided to extend the inspection to a period not to exceed ten years.

Operating Experience

Program assessments covering the period from 2001 to 2007 identified no problems with masonry walls. The assessments concluded the structure inspection program is adequate and effective. Reviews against established program standards provide assurance that the program will remain effective for managing loss of material of components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Masonry Wall Program has been effective at managing aging effects. The Masonry Wall Program assures 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.1.28 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 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 is 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 was considered in the development of this program. Plant operating experience will be gained as the program is implemented and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to potential aging effects for which there is currently no operating experience at GGNS indicating the need for an aging management 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 GGNS in other programs.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Non-EQ Cable Connections Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Cable Connections Program provides assurance that 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.1.29 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 an existing condition monitoring program that manages the aging effects on the following inaccessible power (400 V to 35kV) cable systems.

Cable ID	Voltage Level	Description	Associated Manholes
2DR104B1, B2	34.5 kV	ESF XFMR 21	MH22, MH24
1DR104B1, B2	34.5 kV	ESF XFMR 11	MH14
2DR102D1, D2, D3	34.5 kV	BOP XFMR 12B	MH14, MH10
1DR102D1, D2	34.5 kV	BOP XFMR 12A	MH14, MH10
1DR101D1, D2, D3	34.5 kV	BOP XFMR 11B	MH23, MH25, MH5
1DR101C1, C2	34.5 kV	BOP XFMR 11A	MH13, MH25, MH5
1AA5031	4.16 kV	SSW Pump A Motor	MH20, MH1
1BA6161	4.16 kV	SSW Pump B Motor	MH21, MH1
1AA5041	4.16 kV	Load Center 15BA5	MH20, MH1
1BA6151	4.16 kV	Load Center 16BB5	MH21, MH1
1CB701241 1CB701242	480 V	HPCS SW Pump Motor P41C002	MH2, MH3
1CB711061	480 V	SSW Loop C RTN TO CLG TWR A MOV P41F011	MH2, MH3
1CB701132	480 V	HPCS DSL Gen Jacket Water Heater P81B003B	MH3
1CB701141	480 V	HPCS DSL Gen Space Heater P81S001	MH3
1CB701151	480 V	HPCS DSL Soak Back LO CIRC Pump Motor P81C004B	MH3
1CB701182	480 V	HPCS DSL Gen Jacket Water Heater P81B003A	MH3
1CB701191	480 V	HPCS DSL Soak Back LO CIRC Pump Motor P81C004A	MH3
1CB701212 1CB701213	480 V	HPCS DSL Gen Room Outside Air Fan K77C002	MH3

Cable ID	Voltage Level	Description	Associated Manholes
1CB711031	480 V	HPCS DSL Gen FO Transfer Pump Motor P81C001	MH3

The Non-EQ Inaccessible Power Cables (400 V to 35 kV) Program includes periodic actions to prevent inaccessible cables from being exposed to significant moisture. In this program, inaccessible power (400 V to 35kV) 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 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 events such as heavy rain or flooding will be performed. Inspection frequency will be increased as necessary based on evaluation of inspection results.

NUREG-1801 Consistency

The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program, with enhancements, is 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

The following enhancements will be implemented prior to the period of extended operation, and the first cable tests and manhole inspections will be completed prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope	The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program will be enhanced to include low-voltage (400 V to 2 kV) power cables.

Elements Affected	Enhancements
2. Preventive Actions	The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program will be enhanced. Condition-based inspections of manholes not automatically dewatered by a sump pump will be performed following periods of heavy rain or potentially high water table conditions, as indicated by river level. The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program will be clarified that the manhole inspections will include direct observation that cables are not wetted or submerged, that cables/splices and cable support structures are intact, and verification that dewatering/drainage systems (i.e., sump pumps) and associated alarms if applicable operate properly.

Operating Experience

In the response to GL 2007-01, GGNS reported one cable failure, which was a 480V cable to a motor driven fire pump. The apparent cause was listed as age degradation, moisture, and possible damage during construction that accelerated or created susceptibility to moisture. GGNS has no record of other failures for these types of cables in an underground application. Based on this information and other industry operating experience, Entergy created a fleet cable reliability program that was effective 12/31/2009 for GGNS. The purpose of the program is to provide the means to effectively manage underground medium voltage cables to achieve high reliability while reducing the likelihood of in-service failures. Prior to and after the program effective date, operating experience was used to assist with the program implementation.

During a manhole internal inspection, three electrical manholes were found to be full of water. Two of the manholes had inoperable sump pumps as identified by previous level switch functional PM tasks. The other manhole had no installed sump pump. For the remaining manholes, there was no indication of problems with the sump pumps in these manholes. Corrective actions included identifying which electrical manholes contain sump pumps and which electrical manholes do not. Corrective actions were established to periodically inspect and pump down the manholes with no sump pumps installed.

The standby service water motors are periodically meggered, including the 4160 V cables that are routed through manholes without sump pumps installed. This provides cable monitoring that ensures that no significant degradation exists at the time the megger is performed.

The fleet cable reliability program provides guidance relative to ensuring adequate inspection criteria for cables contained in manholes and includes instructions for inspection of these cables and any required action to initiate further actions to mitigate water intrusion and/or increase the frequency of inspection and dewatering activities. Continued inspection of manholes for water intrusion is providing further information for inspection and testing frequency.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program has been effective at managing aging effects. The Non-EQ Inaccessible Power Cables (400 V to 35kV) Program assures 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.1.30 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 – intermediate range channels (IRMs)
- Neutron monitoring – local power range monitors (LPRMs)
- Neutron monitoring – average power range monitors (APRMs)[1]
- Process radiation monitoring:
  - Main steam radiation monitoring
  - Containment and drywell ventilation exhaust monitoring
  - Fuel handling area exhaust and the fuel handling area pool sweep exhaust monitoring
  - Control room ventilation monitoring

The Non-EQ Instrumentation Circuits Test Review Program assures 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 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 (such as insulation resistance tests or time domain reflectometry) 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.

---

1. The detectors for the APRMs are the same detectors as for the LPRMs.

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 when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to potential aging effects for which there is currently no operating experience at GGNS indicating the need for an aging management program. A search of GGNS operating experience identified no age-related failures of neutron monitoring and high range radiation monitoring system cables and connections at GGNS, and no aging mechanisms not considered in NUREG-1801 have been identified. 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 GGNS in other programs.

The GGNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Non-EQ Instrumentation Circuits Test Review Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Non-EQ Instrumentation Circuits Test Review Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Instrumentation Circuits Test Review Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.31 NON-EQ INSULATED CABLES AND CONNECTIONS

Program Description

The Non-EQ Insulated Cables and Connections Program is a new condition monitoring program that assures 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.

A representative sample consisting of 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 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 10 years, with the first inspection prior to the period of extended operation.

This program will be implemented prior to the period of extended operation.

NUREG-1801 Consistency

The Non-EQ Insulated Cables and Connections Program will be consistent with the program described in NUREG-1801, Section XI.E1, Insulation Material for Electrical Cables and Connections Not Subject to 10 CFR 50.49 Environmental Qualification Requirements.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

The Non-EQ Insulated Cables and Connections Program is a new program. Industry operating experience will be considered when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

Cables for a nonsafety-related valve located in the GGNS feedwater heater room were found to have heat-related degradation. This valve and associated cables have no license renewal intended function. A search of GGNS operating experience identified no age-related failures of cables or cable connections with a license renewal intended function at GGNS.

The GGNS program is based on the program description in NUREG-1801, which in turn is based on industry operating experience that demonstrates that this program is effective for managing the aging effects described herein. As such, operating experience assures that implementation of the Non-EQ Insulated Cables and Connections Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis for the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Non-EQ Insulated Cables and Connections Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Non-EQ Insulated Cables and Connections Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.32 OIL ANALYSIS

Program Description

The Oil Analysis Program is an existing program that ensures that loss of material, cracking, and fouling are not occurring by maintaining oil environments free of contaminants (primarily water and particulates). Testing activities include sampling and analysis of lubricating oil.

The One-Time Inspection Program utilizes inspections or non-destructive evaluations of representative samples to verify that the Oil Analysis Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Oil Analysis Program, with enhancements, is 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.

Elements Affected	Enhancements
1. Scope of Program	The Oil Analysis Program will be enhanced to include piping and components within the main generator system (N41) with an internal environment of lube oil.
3. Parameters Monitored or Inspected 4. Detection of Aging Effects 6. Acceptance Criteria	The Oil Analysis Program will be enhanced to provide a formalized analysis technique for particulate counting.

Operating Experience

Division I & II diesel engine lubricating oil sample results for 2001 through 2010 were satisfactory.

Fire water diesel engine lubricating oil sample results for 2000 through 2010 were satisfactory. However, both fire water diesels had samples with high particle count. This was attributed to faulty lab equipment, and samples were taken at more frequent intervals to track the conditions. Even though the samples showed high particle count, the level was still below the limit and was evaluated to be satisfactory for continued service.

Samples of crankcase oil from the high pressure core spray diesel generator (Division III) taken between 2005 and 2010 revealed possible high metal count. Continued observation was called for to determine if this was caused by metal wear particles or malfunction of lab equipment. From 2008 on the samples were normal, indicating a malfunction of lab equipment in the earlier samples.

A sample of Division I diesel engine lubricating oil in 2007 indicated trace amounts of moisture contamination. Oil viscosity and other parameters were within manufacturer specifications. A contaminated sample tubing was suspected, and a resample was performed with clean sampling apparatus to confirm this.

A sample of drywell purge compressor lubricating oil in 2008 indicated moisture contamination. A resample was performed and no abnormal results were noted.

Identification of signs of possible degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for carbon steel components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Oil Analysis Program has been effective at managing aging effects. The Oil Analysis Program assures 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 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 one of the following:

- Verify the effectiveness of an AMP that is designed to prevent or minimize aging to the extent that it will not cause the loss of intended function during the period of extended operation.
- Confirm the insignificance of an aging effect for situations in which additional confirmation is appropriate.

Inspections that verify unacceptable degradation is not occurring will be used.

The sample size of components to be inspected will be based on an assessment of materials, environment, aging effects, and 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.

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	One-time inspection activity will verify the effectiveness of the diesel fuel monitoring aging management programs by confirming that unacceptable loss of material is not occurring.
Oil analysis program	One-time inspection activity will verify the effectiveness of the oil analysis aging management programs by confirming that unacceptable cracking, loss of material, and fouling is not occurring.
Water chemistry control program	One-time inspection activity will verify the effectiveness of the water chemistry control – BWR aging management program by confirming that unacceptable cracking, loss of material, and fouling is not occurring.

The inspection 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 when implementing this program. Plant operating experience for this program will be gained as it is implemented and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

As stated in NUREG-1801, Section XI.M32, the elements of these inspections (e.g., the scope of the inspections and inspection techniques) are consistent with industry practice and use developed and approved 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 Flow-Accelerated Corrosion and ASME Section XI. 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 this program is discussed in Section B.0.4.

Conclusion

The One-Time Inspection Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The One-Time Inspection Program provides assurance that the Water Chemistry Control, Diesel Fuel Monitoring, and Oil Analysis programs will be effective in managing the effects of aging to ensure component intended functions can be maintained in accordance with the current licensing basis through the period of extended operation.

B.1.34 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. GGNS 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. The program can also be used for systems that have experienced cracking but have implemented design changes to effectively mitigate cracking.

This program provides a one-time volumetric inspection of a sample of these Class 1 piping locations that are susceptible to cracking. The program includes pipes, fittings, branch connections, and all full and partial penetration (socket) welds.

This program includes a statistically significant sampling approach. Sample selection is based on susceptibility to stress corrosion, cyclic loading (including thermal, mechanical, and vibration fatigue), or thermal stratification and thermal turbulence.

The program includes measures to verify that degradation is not occurring, thereby either confirming that there is no need to manage aging-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.

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 when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations and will be factored into the program via the confirmation and corrective action elements of the GGNS 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) for which there is no operating experience at GGNS that indicates the need for an aging management program. As stated in NUREG 1801, Section XI.M35, this program will use volumetric or destructive inspection techniques with demonstrated capability and a proven industry record to detect cracking in piping weld and base material. As such, operating experience assures that implementation of the One-Time Inspection – Small-Bore Piping Program will manage the effects of aging such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The One-Time Inspection – Small-Bore Piping Program will be effective for managing aging effects since it will incorporate proven inspection techniques, acceptance criteria, corrective actions, and administrative controls. The One-Time Inspection – Small-Bore Piping Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.35 PERIODIC SURVEILLANCE AND PREVENTIVE MAINTENANCE

Program Description

There is no corresponding NUREG-1801 program.

The Periodic Surveillance and Preventive Maintenance Program is an existing program that manages aging effects not managed by other aging management programs, including loss of material, cracking, and change in material properties.

Credit for program activities has been taken in the aging management review of the following systems and structures.

Containment Building	Visually inspect and manually flex the rubber gasket/seal for upper containment pool gates to verify the absence of cracks and significant change in material properties.
Low pressure core spray system (LPCS)	Use visual or other NDE techniques to inspect external surface of LPCS piping passing through the waterline region of suppression pool to manage loss of material.
Residual heat removal (RHR) system	Use visual or other NDE techniques to inspect external surface of RHR piping passing through the waterline region of suppression pool to manage loss of material.
Pressure relief system	Use visual or other NDE techniques to inspect external surface of pressure relief system piping passing through the waterline region of the suppression pool to manage loss of material.
Reactor core isolation cooling (RCIC) system	Use visual or other NDE techniques to inspect external surfaces of RCIC system piping passing through the waterline region of the suppression pool to manage loss of material.
Nonsafety-related systems affecting safety-related systems	Visually inspect the internal surfaces of a representative sample of piping in the control rod drive (CRD) system to manage loss of material. Visually inspect the internal surfaces of a representative sample of piping and valve bodies in the circulating water system (N71) to manage loss of material. Visually inspect the internal surfaces of a representative sample of piping and valve bodies in the floor and equipment drain system (P45) to manage loss of material.
High pressure core spray (HPCS) system	Use visual or other NDE techniques to inspect HPCS piping passing through the waterline region of the suppression pool to manage loss of material.

Floor and equipment drain system	Use visual or other NDE techniques to inspect piping below the waterline in the in-scope sumps to manage loss of material. Visually inspect the internal surfaces of a representative sample of piping, drain housings, and valve bodies in the floor and equipment drain system (P45) 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 GGNS Periodic Surveillance and Preventive Maintenance Program monitors and inspects parameters linked to the degradation of the particular structure or component-intended function(s).

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.

For each activity that refers to a representative sample, a representative sample is 20% 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.

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.

NDE measurements were made on Division II diesel generator exhaust piping in 2005 to check wall thickness. Analysis of the data showed acceptable results. There was no other indication of aging such as erosion or corrosion. Preventive maintenance test results confirming the absence of significant wall loss provides evidence that the program is effective for managing loss of material.

In 2006, visual inspection of the internal surfaces of a check valve in the component cooling water system found significant wear. The affected parts were replaced and the valve was returned to service. There was no other indication of aging such as erosion or corrosion. Identification of signs of possible degradation and corrective action prior to loss of intended function provides evidence that the program is effective for managing aging effects for components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Enhancements

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
1. Scope of Program 3. Parameters Monitored or Inspected 4. Detection of Aging Effects 6. Acceptance Criteria	The Periodic Surveillance and Preventive Maintenance Program will be enhanced to revise program guidance documents 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 managing aging effects. The Periodic Surveillance and Preventive Maintenance Program assures 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 PROTECTIVE COATING MONITORING AND MAINTENANCE

Program Description

The Protective Coating Monitoring and Maintenance Program is an existing program that monitors and maintains service level I coatings inside containment. The program assesses coating condition through visual inspections.

NUREG-1801 Consistency

The Protective Coating Monitoring and Maintenance Program, with enhancements, is 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.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected	The Protective Coating Monitoring and Maintenance Program will be enhanced to include parameters monitored or inspected per the guidance provided in ASTM D5163-08.
4. Detection of Aging Effects	The Protective Coating Monitoring and Maintenance Program will be enhanced to provide for inspection of coatings near sumps or screens associated with the emergency core cooling system.
6. Acceptance Criteria	The Protective Coating Monitoring and Maintenance Program will be enhanced to include acceptance criteria per ASTM D 5163-08.

Operating Experience

Visual inspection of coatings in 2000, 2002, 2005, 2007, 2008, and 2010 found no conditions that required immediate repair. Locations with varying degrees of corrosion and minor pitting were noted for future inspections.

The Protective Coating Monitoring and Maintenance Program detects aging effects using visual techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed for other programs at GGNS. The application of these proven methods provides assurance that the effects of aging will be managed such that the Protective Coating Monitoring and Maintenance Program 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 this program is discussed in Section B.0.4.

Conclusion

The Protective Coating Monitoring and Maintenance Program has been effective at managing aging effects. The Protective Coating Monitoring and Maintenance Program assures 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 REACTOR HEAD CLOSURE STUDS

Program Description

The Reactor Head Closure Studs Program is an existing program that manages cracking and loss of material for reactor head closure stud bolting using inservice inspection and preventive measures. ASME Section XI examination and inspection requirements specified in Table IWB-2500-1 are used. The program also relies on recommendations to address reactor head closure stud bolting degradation listed in NUREG-1339 and NRC Regulatory Guide 1.65.

NUREG-1801 Consistency

The Reactor Head Closure Studs Program is consistent with the program described in NUREG-1801, Section XI.M3, Reactor Head Closure Stud Bolting, with one exception.

Exceptions to NUREG-1801

The Reactor Head Closure Studs Program is consistent with the program described in NUREG-1801, Section XI.M3, Reactor Head Closure Stud Bolting, with the following exception.

Elements Affected	Exception
2. Preventive Actions	NUREG-1801 recommends use of bolting material for closure studs that has an actual measured yield strength less than 1,034 megapascals (MPa) (150 kilo-pounds per square inch). GGNS uses bolting material for closure studs with a maximum reported ultimate tensile strength below 170 kilo-pounds per square inch.[1]

Exception Note

1. The criterion of actual yield strength less than 150 kilo-pounds per square inch (ksi) was recommended in Section 3 of NUREG-1339 to be used as the level for consideration of vulnerability to stress corrosion cracking (SCC). The studs, nuts and washers at GGNS are fabricated from SA 540 Grade B23 or B24 carbon steel, which has a minimum yield strength of 130 ksi. Data relative to actual yield strength for the installed reactor head closure studs is not available. However, SA 540 Grades B23 and B24 are high-strength, low alloy materials that, when tempered to a maximum tensile strength of 170 ksi, are relatively immune to stress corrosion cracking. Therefore, the studs installed at GGNS are relatively immune to stress corrosion cracking. Nevertheless, since the actual yield strength of the installed studs is not known, the aging management review conservatively identified the stud material as "high strength low alloy steel" susceptible to the aging effect of cracking. The examination methods used for stud inspection in the Reactor Head Closure Studs Program are appropriate to identify cracking. Therefore, the 150 ksi actual yield strength preventive measure is not necessary to assure that the reactor head closure studs can perform their intended function consistent with the current licensing basis through the period of extended operation.

Enhancements

None

Operating Experience

Surface examination of reactor pressure vessel (RPV) studs, nuts, and washers during RF11 and RF12 from 2001 through 2010 identified no relevant indications. Continuing examination of the studs, washers, and nuts and evaluation of the results provide evidence that the program remains effective in managing and detecting cracking and loss of material in the bolting.

The Reactor Head Closure Studs Program detects aging effects using NDE visual, surface and volumetric techniques to detect and characterize flaws. These techniques are widely used and have been demonstrated effective at detecting aging effects during inspections performed to meet ASME Section XI Code requirements. The application of these proven methods provides assurance that the effects of aging will be managed such that the Reactor Head Closure Studs Program 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 this program is discussed in Section B.0.4.

Conclusion

The Reactor Head Closure Studs Program has been effective at managing aging effects. The Reactor Head Closure Studs Program assures 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.1.38 REACTOR VESSEL SURVEILLANCE

Program Description

The Reactor Vessel Surveillance Program is an existing program that manages reduction of fracture toughness 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 10CFR50, Appendix H for vessel material surveillance. An integrated surveillance program based on staff-approved BWRVIP documents (including BWRVIP-86-A, BWRVIP-102, BWRVIP-135) has been approved for use by NRC.

NUREG-1801 Consistency

The Reactor Vessel Surveillance Program, with enhancements, is consistent with the program described in NUREG-1801, Section XI.M31, Reactor Vessel Surveillance.

Exceptions to NUREG-1801

None

Enhancements

The following enhancement will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
5. Monitoring and Trending	The GGNS Reactor Vessel Surveillance Program will be enhanced to ensure that the additional requirements specified in the final NRC safety evaluation for BWRVIP-86 Revision 1 will be addressed before the period of extended operation.

Operating Experience

GGNS has committed to using the Boiling Water Reactor Vessel and Internals Project (BWRVIP) Integrated Surveillance Program (ISP). The fact that the plant participates in the BWRVIP ISP ensures that future operating experience from all participating BWRs will be factored into this program.

Updated values for vessel fluence and applicable surveillance capsule materials data were used for the 2005 publication of the calculation on which the management of reactor vessel fracture toughness is based. Updated vessel surveillance capsule material test results and data from the BWRVIP were used for a revision of this calculation in 2008, to provide the updated adjusted reference temperature values and to evaluate impact on the pressure-temperature curves. The analysis in this calculation confirmed that the aging effect of reduction of fracture toughness is adequately managed.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4

Conclusion

The Reactor Vessel Surveillance Program has been effective at managing aging effects. The Reactor Vessel Surveillance Program assures 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 RG 1.127, INSPECTION OF WATER-CONTROL STRUCTURES ASSOCIATED WITH NUCLEAR POWER PLANTS

Program Description

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program is an existing program that requires periodic monitoring 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 contains guidance on engineering data compilation, inspection activities, technical evaluation, inspection frequency, and the content of inspection reports.

NUREG-1801 Consistency

The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program, with enhancements, is 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

The following enhancements will be implemented prior to the period of extended operation.

Elements Affected	Enhancements
4. Detection of Aging Effects	The RG 1.127 Program will be enhanced to clarify that detection of aging effects will monitor accessible structures on a frequency not to exceed five years, consistent with the frequency for implementing the requirements of RG 1.127.
4. Detection of Aging Effects	The program will be enhanced to perform periodic sampling, testing, and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least every five years.
6. Acceptance Criteria	The program will be enhanced to include quantitative acceptance criteria for evaluation and acceptance based on the guidance provided in ACI 349.3R.

Operating Experience

A small piece of concrete on the edge of the concrete slab that surrounds the standby service water (SSW) ultimate heat sink basin was discovered to be missing in 2004. An engineering walk-down of the entire perimeter of the basin confirmed this to be the only new piece of missing concrete. The "break area" was found to be relatively clean, with no exposed re-bar or large aggregate. This was evaluated and found to be acceptable with no further action required. Identification of degradation and evaluation of impact prior to loss of intended function provide evidence that the program is effective for managing aging effects.

Identification of signs of possible degradation and corrective action prior to loss of intended function provides evidence that the program is effective for managing aging effects for components.

The process for review of future plant-specific and industry operating experience for this program 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 managing aging effects. The RG 1.127, Inspection of Water-Control Structures Associated with Nuclear Power Plants Program assures 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 SELECTIVE LEACHING

Program Description

The Selective Leaching Program is a new program that includes a one-time visual inspection of selected components coupled with hardness measurement or other mechanical examination techniques to determine whether loss of material is occurring due to selective leaching.

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 when implementing this program. Plant operating experience for this program will be gained as it is implemented during the period of extended operations, and will be factored into the program via the confirmation and corrective action elements of the GGNS 10 CFR 50 Appendix B quality assurance program.

This inspection program applies to potential aging effects for which there is currently no operating experience at GGNS indicating the need for an aging management program. As stated in NUREG-1801, 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 this program is discussed in Section B.0.4.

Conclusion

The Selective Leaching Program will be effective for managing aging effects since it will incorporate proven monitoring techniques, acceptance criteria, corrective actions, and administrative controls. The Selective Leaching Program provides assurance that effects of aging will be managed such that applicable components will continue to perform their intended functions consistent with the current licensing basis through the period of extended operation.

B.1.41 SERVICE WATER INTEGRITY

Program Description

The Service Water Integrity Program is an existing program that manages loss of material and fouling in open-cycle cooling water systems as described in the GGNS response to NRC GL 89-13.

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

A snapshot program self-assessment in 2002 concluded that the standby service water (SSW) system meets its design and licensing bases and that it is capable of performing its safety functions.

Results of a QA audit in 2003 indicated that the service water integrity program was effective in meeting regulatory requirements and applicable codes and standards.

A program assessment in 2003 identified degraded areas of coating based on inspections of submerged piping in SSW basins. A corrective action plan was initiated and completed to address this issue. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects.

In 2004 a strategic plan was established to define monitoring practices and establish a chemical treatment program for the continued improvement in the performance of the SSW system. The plan includes controls for biological fouling, scale formation, solids deposition, and metal corrosion inhibition. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

A QA audit in 2007 focused on reviewing responses and action plans to address program issues that had been identified by NRC and by an Entergy corporate assessment the previous year. Corrective action plans were reviewed and found to contain well-documented causes with timely action plans. This audit confirmed that the service water integrity program was being implemented in a manner that resulted in effective monitoring, inspection, and detection of degradation.

A program assessment in 2009 evaluated the health of the system and the program, corrective action resolution and timeliness, preventive maintenance backlog, leaks and leak repairs, trending and monitoring practices, long-range plans, and operating experience reviews. The report concluded that performance and regulatory margin of the SSW system will be restored once appropriate corrective actions are implemented for certain structural and operational issues. Corrective actions were set forth to address these issues. The execution of aggressive preventive maintenance, inspections and effective chemical treatment assure the long-term integrity of the system.

A QA audit in 2009 confirmed that the service water integrity program was being implemented in a manner that resulted in effective monitoring, inspection, and detection of degradation.

During a visual inspection in 2010, excessive pitting and corrosion was detected on a standby service water valve body and discharge flange. Ultrasonic (UT) examination was performed, and UT data indicated the remaining wall thickness for the valve body was in excess of the minimum wall thicknesses required by ASME Code. Identification and evaluation of aging effects prior to loss of intended function provides evidence that the program remains effective.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Service Water Integrity Program has been effective at managing aging effects. The Service Water Integrity Program assures 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.1.42 STRUCTURES MONITORING

Program Description

The Structures Monitoring Program is an existing program that manages the effects of aging on structures and structural components, including structural bolting, within the scope of license renewal. The program was developed based on guidance in 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."

NUREG-1801 Consistency

The Structures Monitoring Program, with enhancements, is 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.

Elements Affected	Enhancements
1. Scope of Program	The Structures Monitoring Program will be enhanced to clarify that the scope will (a) Include the following in-scope structures and structural components. • Containment building (GGN2) • Control house – switchyard • Culvert No. 1 and drainage channel • Manholes and duct banks • Radioactive waste building pipe tunnel

Elements Affected	Enhancements
(cont.)	(b) Include the following in-scope structural components. • Anchor bolts • Anchorage / embedments • Base plates • Basin debris screen and grating • Battery racks • Beams, columns, floor slabs and interior walls • Cable tray and cable tray supports • Component and piping supports • Conduit and conduit supports • Containment sump liner and penetrations • Containment sump structures • Control room ceiling support system • Cooling tower drift eliminators • Cooling tower fill • CST/RWST retaining basin (wall) • Diesel fuel tank access tunnel slab • Drainage channel • Drywell floor slab (concrete) • Drywell wall (concrete) • Duct banks • Electrical and instrument panels and enclosures • Equipment pads/foundations • Exterior walls • Fan stack grating • Fire proofing • Flood curbs • Flood retention materials (spare parts) • Flood, pressure and specialty doors • Floor slab • Foundations • HVAC duct supports • Instrument line supports • Instrument racks, frames and tubing trays • Interior walls • Main steam pipe tunnel • Manholes

Elements Affected	Enhancements
(cont.)	• Manways, hatches, manhole covers, and hatch covers • Metal siding • Missile shields • Monorails • Penetration sealant (flood, radiation) • Penetration sleeves (mechanical/ electrical not penetrating primary containment boundary) • Pipe whip restraints • Pressure relief panels • Reactor pedestal • Reactor shield wall (steel portion) • Roof decking • Roof hatches • Roof membrane • Roof slabs • RPV pedestal sump liner and penetrations • Seals and gaskets (doors, manways and hatches) • Seismic isolation joint • Stairway, handrail, platform, grating, decking, and ladders • Structural bolting • Structural steel beams, columns, and plates • Sumps and sump liners • Support members: welds, bolted connections, support anchorages to building structure • Support pedestals • Transmission towers[1] • Upper containment pool floor and walls • Vents and louvers (c) Clarify the term “significant degradation” to include the phrase, “that could lead to loss of structural integrity.” (d) Include guidance to perform periodic sampling and analysis of ground water chemistry for pH, chlorides, and sulfates on a frequency of at least once every five years.

Elements Affected	Enhancements
3. Parameters Monitored or Inspected	The Structures Monitoring Program will be enhanced to clarify that parameters monitored or inspected will (a) Include the inspection for missing nuts for the structural connections. (b) Include monitoring of sliding/bearing surfaces, such as lubrite plates for loss of material due to wear or corrosion, debris, or dirt. The program will be enhanced to include monitoring elastomeric vibration isolators and structural sealants for cracking, loss of material, and hardening.
4. Detection of Aging Effects	The Structures Monitoring Program will be enhanced to clarify that detection of aging effects will (a) Include inspection requirements for vibration isolators will be enhanced to include augmented inspections by feel or touch to detect hardening if the vibration isolation function is suspect. (b) Require inspections every five years for structures and structural components within the scope of license renewal unless technical justification is provided to extend the inspection to a period not to exceed ten years.
6. Acceptance Criteria	The Structures Monitoring Program acceptance criteria will be enhanced by prescribing acceptance criteria 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-96. Industry and plant-specific operating experience will also be considered in the development of the acceptance criteria.

1. The inspections of these structures may be performed by the transmission personnel. However, the results of the inspections will be provided to the GGNS Structures Monitoring Program owner for review.

Operating Experience

During a 2007 inspection, Door 1M112 at the standby service water valve room would not open completely due to sinking of the concrete enclosure over the door. A review of reports from 1990 and 1998 indicated a gradual vertical settlement in this area. A review of the applicable design calculation indicated that the vertical settlement was not an issue for the shield wall, although it could interfere with the ability to use the door. An engineering change was prepared to allow removal of concrete in the area where the door is rubbing. Identification of degradation and corrective action prior to loss of intended function provide evidence that the program is effective for managing aging effects for structural components.

Water leaking in the reactor water cleanup (RWCU) heat exchanger room from a crack in the ceiling was identified during an RF15 walkdown in 2007. This crack had been earlier identified as a result of shrinkage in 1987. Samples of the leakage were tested for iron with negative results, indicating that corrosion of the concrete reinforcing steel was not occurring. The reinforced concrete structure of the RWCU heat exchanger room was found to be structurally adequate. Evaluation of degradation prior to loss of intended function provides evidence that the program is effective for managing aging effects for structural components.

Structures Monitoring periodic assessments covering the period from 2001 through 2007 identified no major structural problems. Corrective actions were set forth for minor structural degradations. The assessments concluded the Structures Monitoring Program is adequate and effective.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Structures Monitoring Program has been effective at managing aging effects. The Structures Monitoring Program assures 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 – BWR

Program Description

The Water Chemistry Control – BWR Program is an existing program that manages loss of material, cracking, and fouling in components exposed to a treated water environment through monitoring and control of water chemistry. EPRI water chemistry guidelines are used.

The One-Time Inspection Program utilizes inspections or non-destructive evaluations of representative samples to verify that the Water Chemistry Control – BWR Program has been effective at managing aging effects.

NUREG-1801 Consistency

The Water Chemistry Control – BWR Program is consistent with the program described in NUREG-1801, Section XI.M2, Water Chemistry.

Exceptions to NUREG-1801

None

Enhancements

None

Operating Experience

SOER 03-02, Managing Core Design Changes, was issued to address unsuccessful industry efforts to obtain defect-free fuel performance. This SOER required an evaluation of the effects of chemistry changes on core and fuel performance and the effects of core and fuel design changes on coolant chemistry. This evaluation required a review of chemistry-related issues and how these issues are addressed in the Water Chemistry Control – BWR Program. The results of this review and the required responses upgraded and confirmed the effectiveness of the program. Identification of program deficiencies, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material of components.

In 2006 a QA audit indicated that the chemistry program was effective in meeting intended results. The program was found to adequately prevent chemistry excursions related to reactor water sulfates and feedwater iron and to provide protection of plant components through effective chemistry control, monitoring, calculation, and reporting of chemistry data.

During the period from 2007 through 2010, several condition reports were initiated due to adverse trends in parameters monitored by the Water Chemistry Control – BWR Program. Corrective actions were taken within the Corrective Action Program to preclude reaching unacceptable values for the parameters monitored. No impact on plant materials was experienced. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

An assessment of the effectiveness of corrective actions for elevated sulfate concentration in the reactor coolant was performed in 2008. This included a review of analytical data, post-corrective-action baseline sulfate concentration, and comparison of analytical data for sulfate performance during period 2007–2008 during steady state, transient state and hot weather conditions. The assessment concluded the actions taken to reduce the level of sulfate concentration in the reactor coolant were successful and included new actions and recommendations which were resolved to upgrade the program to enhance its effectiveness.

In 2009 a strategic plan was established to implement water chemistry initiatives. The plan optimized corrosion control for the reactor vessel, primary system components, and balance of plant (BOP) components. It was based upon industry experience and guidelines, BWR cycle design, and BWR metallurgy. The plan emphasized the reduction of intergranular stress corrosion cracking in primary system components, minimization of flow accelerated corrosion in BOP systems, high standards of fuel integrity, and minimization of radiation field buildup. An advanced resin cleaning system was implemented to improve the cleaning of condensate resins. Condensate temperatures were managed in cold weather months to improve iron removal. Identification of needed program enhancements, and subsequent corrective actions, provide assurance that the program will remain effective for managing loss of material, cracking, and fouling of components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Water Chemistry Control – BWR Program has been effective at managing aging effects. The Water Chemistry Control – BWR Program assures 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.1.44 WATER CHEMISTRY CONTROL – CLOSED TREATED WATER SYSTEMS

Program Description

The Water Chemistry Control – Closed Treated Water Systems Program is an existing program that manages loss of material, cracking, and fouling in components exposed to a treated water environment through monitoring and control of water chemistry as well as visual inspections.

NUREG-1801 Consistency

The Water Chemistry Control – Closed Treated Water Systems Program, with enhancements, is 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.

Elements Affected	Enhancements
1. Scope of Program 2. Preventive Actions	The Water Chemistry Control – Closed Treated Water Systems Program will be enhanced to provide a corrosion inhibitor for the engine jacket water on the engine-driven fire water pump diesels in accordance with industry guidelines and vendor recommendations.
3. Parameters Monitored or Inspected	The Water Chemistry Control – Closed Treated Water Systems Program will be enhanced to provide periodic flushing of the engine jacket water and cleaning of heat exchanger tubes for the engine-driven fire water pump diesels in accordance with industry guidelines and vendor recommendations.
4. Detection of Aging Effects	The Water Chemistry Control – Closed Treated Water Systems Program will be enhanced to provide testing of the engine jacket water for the engine-driven fire water pump diesels at least once per refueling cycle.

Elements Affected	Enhancements
4. Detection of Aging Effects	The Water Chemistry Control – Closed Treated Water Systems Program will be enhanced to conduct inspections whenever a boundary is opened for the following systems. • Drywell chilled water (DCW, system P72) • Plant chilled water (PCW, system P71) • Diesel generator cooling water subsystem for Division I and II standby diesel generators • Diesel engine jacket water for engine-driven fire water pumps • Diesel generator cooling water subsystem for Division III (HPCS) diesel generator • Turbine building cooling water (TBCW, system P43) • Component cooling water (CCW, system P42) These inspections will be conducted in accordance with applicable ASME Code requirements, industry standards, and other plant-specific inspection and personnel qualification procedures that are capable of detecting corrosion or cracking.

Elements Affected	Enhancements
4. Detection of Aging Effects	The Water Chemistry Control –- Closed Treated Water Systems Program will be enhanced to inspect a representative sample of piping and components at a frequency of once every ten years for the following systems. • Drywell chilled water (DCW, system P72) • Plant chilled water (PCW, system P71) • Diesel generator cooling water subsystem for Division I and II standby diesel generators • Diesel engine jacket water for engine-driven fire water pumps • Diesel generator cooling water subsystem for Division III (HPCS) diesel generator • Turbine building cooling water (TBCW, system P43) • Component cooling water (CCW, system P42) Components inspected will be those with the highest likelihood of corrosion or cracking. A representative sample is 20% of the population (defined as components having the same material, environment, and aging effect combination) with a maximum of 25 components. The inspection methods 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.

Operating Experience

In 2007 a strategic plan was established to define monitoring practices and a chemical treatment program for the continued improvement in the performance of plant systems in the Water Chemistry Control – Closed Treated Water Systems Program. The plan set forth a program that will minimize corrosion, cost, monitoring requirements and frequent adjustments.

During the period from 2008 through 2010, several condition reports were initiated due to adverse trends in parameters monitored by the Water Chemistry Control – Closed Treated Water Systems Program. Corrective actions were taken within the Corrective Action Program to preclude reaching unacceptable values for the parameters monitored. The routine confirmation of water quality and use of appropriate timely corrective action provide evidence that the program is effective in managing loss of material for applicable components.

The process for review of future plant-specific and industry operating experience for this program is discussed in Section B.0.4.

Conclusion

The Water Chemistry Control – Closed Treated Water Systems Program has been effective at managing aging effects. The Water Chemistry Control – Closed Treated Water Systems Program assures 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 U.S. Nuclear Regulatory Commission, NUREG-1800, *Standard Review Plan for Review of License Renewal Applications for Nuclear Power Plants*, Revision 2, December 2010.

B.2-2 U.S. Nuclear Regulatory Commission, NUREG-1801, *Generic Aging Lessons Learned (GALL) Report*, Revision 2, December 2010.

Appendix C

Response to BWRVIP Applicant Action Items

Grand Gulf Nuclear Station

Of the BWRVIP documents credited for GGNS license renewal, the following have NRC safety evaluation (SE) reports for license renewal.

BWRVIP-18	BWR Core Spray Internals Inspection and Flaw Evaluation Guidelines, Revision 1
BWRVIP-25	BWR Core Plate Inspection and Flaw Evaluation Guidelines
BWRVIP-26-A	BWR Top Guide Inspection and Flaw Evaluation Guidelines
BWRVIP-27-A	BWR Standby Liquid Control System / Core Plate ∆P Inspection and Flaw Evaluation Guidelines
BWRVIP-38	BWR Shroud Support Inspection and Flaw Evaluation Guidelines
BWRVIP-41	BWR Jet Pump Assembly Inspection and Flaw Evaluation Guidelines, Revision 2
BWRVIP-42	LPCI Coupling Inspection and Flaw Evaluation Guidelines, Revision 1
BWRVIP-47-A	BWR Lower Plenum Inspection and Flaw Evaluation Guidelines
BWRVIP-48-A	Vessel ID Attachment Weld Inspection and Flaw Evaluation Guidelines
BWRVIP-49-A	Instrument Penetration Inspection and Flaw Evaluation Guidelines
BWRVIP-74-A	BWR Reactor Vessel Inspection and Flaw Evaluation Guidelines
BWRVIP-76-A	BWR Core Shroud Inspection and Flaw Evaluation Guidelines

License renewal applicant action items identified in the corresponding SE report for each of the above reports are addressed in the following table. BWRVIP documents without SE reports for license renewal have no applicant action items and are therefore not included in the table.

The SE reports contain three common applicant action items, which are addressed only once in the table. For SE reports that contain additional applicant action items, the response is provided separately following the responses to the three common action items.

The SE report for BWRVIP-76-A identified no license renewal applicant action items but stated that the report is considered by the NRC staff to be acceptable for use during a facility's current operating term or extended license period.

Action Item Description	Response
Common Action Items from BWRVIP-18 Rev. 1, -25, -26-A, -27-A, -38, -41 Rev 2, -42 Rev. 1, -47-A, -48-A, -49-A, -74-A	
BWRVIP-All (1) The license renewal applicant is to verify that its plant is bounded by the report. Further, the renewal applicant is to commit to programs described as necessary in the BWRVIP reports to manage the effects of aging during the period of extended operation. Applicants for license renewal will be responsible for describing any such commitments and identifying how such commitments will be controlled. Any deviations from the aging management programs within these BWRVIP reports described as necessary to manage the effects of aging during the period of extended operation and to maintain the functionality of the components or other information presented in the report, such as materials of construction, will have to be identified by the renewal applicant and evaluated on a plant-specific basis in accordance with 10 CFR 54.21(a)(3) and (c)(1).	The BWRVIP reports have been reviewed and GGNS has been verified to be bounded by the reports. Additionally, GGNS commits to programs described as necessary in the BWRVIP reports to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10 CFR 50, Appendix B. Deviation from a BWRVIP report approved by the NRC will be reported to the NRC per BWRVIP-94.
BWRVIP-All (2) 10CFR54.21(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 license renewal referencing the applicable BWRVIP report shall ensure that the programs and activities specified as necessary in the applicable BWRVIP reports are summarily described in the FSAR supplement.	The UFSAR supplement is included as Appendix A and includes a summary of the programs and activities specified as necessary for the BWRVIP program.

Action Item Description	Response
BWRVIP-All (3) 10CFR 54.22 requires that each application for license renewal include any technical specification changes (and the justification for the changes) or additions necessary to manage the effects of aging during the period of extended operation as part of the renewal application. The applicable BWRVIP reports may state that there are no generic changes or additions to technical specifications associated with the report as a result of its aging management review and that the applicant will provide the justification for plant-specific changes or additions. Those applicants for license renewal referencing the applicable BWRVIP report shall ensure that the inspection strategy described in the reports does not conflict with or result in any changes to their technical specifications. If technical specification changes or additions do result, then the applicant must ensure that those changes are included in its application for license renewal.	No technical specification changes have been identified for GGNS based upon the BWRVIP reports.
Additional Action Items	
BWRVIP-18 Rev. 1, Core Spray Internals Inspection and Flaw Evaluation Guidelines	
BWRVIP-18 Rev. 1 (4) Applicants referencing the BWRVIP-18 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components.	TLAA issues identified for core spray internals have been evaluated for GGNS in LRA Section 4.3.1.3.
BWRVIP-25, Core Plate Inspection and Flaw Evaluation Guidelines	
BWRVIP-25 (4) Due to susceptibility of the rim hold-down bolts to stress relaxation, applicants referencing the BWRVIP-25 report for license renewal should identify and evaluate the projected stress relaxation as a potential TLAA issue.	BWRVIP-25 concluded that preload of the rim hold-down bolts is required to prevent lateral motion of the core plate for those plants that have not installed core plate wedges. Since GGNS is a BWR/6 with core plate wedges, the preload on the core plate bolts is not required. Therefore, there is no associated TLAA for GGNS.

Action Item Description	Response
BWRVIP-25 (5) Until such time as an expanded technical basis for not inspecting the rim hold-down bolts is approved by the staff, applicants referencing the BWRVIP-25 report for license renewal should continue to perform inspections of the rim hold-down bolts.	Under the guidance and recommendations of BWRVIP-25, no core plate or rim hold-down bolt inspections are recommended for BWR/6 reactors such as GGNS.
BWRVIP-26-A, Top Guide Inspection and Flaw Evaluation Guidelines	
BWRVIP-26-A (4) Due to IASCC susceptibility of the subject safety-related components, applicants referencing the BWRVIP-26 report for license renewal should identify and evaluate the projected accumulated neutron fluence as a potential TLAA issue.	Accumulated neutron fluence projected to 60 years for GGNS exceeds the threshold for IASCC susceptibility for the top guide. However, BWRVIP-26-A does not constitute a TLAA for GGNS since it was not used to make any safety determination or as justification for reducing the number of inspections. Since GGNS has implemented the inspection requirements of BWRVIP-26-A and BWRVIP-183, the BWR Vessel Internals Program will adequately manage the effects of aging on the top guide for the period of extended operation.
BWRVIP-27-A, Standby Liquid Control System / Core Plate ΔP Internals Inspection and Flaw Evaluation Guidelines	
BWRVIP-27-A (4) Due to the susceptibility of the subject components to fatigue, applicants referencing the BWRVIP-27 report for license renewal should identify and evaluate the projected fatigue cumulative usage factors as a potential TLAA issue.	The fatigue analysis of the standby liquid control (SLC)/core ΔP line for 60 years of operation is a potential TLAA. However, the NRC Safety Evaluation for BWRVIP-27 recognizes this fatigue analysis is not required for all SLC/core ΔP configurations. At GGNS the core spray assembly provides the flow path for injection of boron for the SLC system. The ΔP/SLC lines inside the reactor vessel have no license renewal intended function and are not subject to aging management review. There are thus no TLAA applicable to GGNS in BWRVIP-27-A.

Action Item Description	Response
BWRVIP-42, Rev.1 LPCI Coupling Inspection and Flaw Evaluation Guidelines	
BWRVIP-42, Rev. 1 (4) Applicants referencing the BWRVIP-42 report for license renewal should identify and evaluate any potential TLAA issues which may impact the structural integrity of the subject RPV internal components.	The potential TLAA issues for LPCI components have been evaluated for GGNS in LRA Section 4.3.1.3.
BWRVIP-42, Rev. 1 (5) The BWRVIP committed to address development of the technology to inspect inaccessible welds and to have the individual [license renewal] LR applicant notify the NRC of actions planned. Applicants referencing the BWRVIP-42 report for license renewal should identify this action as open and to be addressed once the BWRVIP's response to this issue has been reviewed and accepted by the staff.	The BWRVIP has developed strategies to ensure the integrity of inaccessible welds. These strategies are included in Section 3 of BWRVIP-42, Revision 1. GGNS has committed to programs described as necessary in the BWRVIP reports to manage the effects of aging during the period of extended operation. Commitments are administratively controlled in accordance with the requirements of 10CFR50, Appendix B.
BWRVIP-47-A, BWR Lower Plenum Inspection and Flaw Evaluation Guidelines	
BWRVIP-47-A (4) Due to fatigue of the subject safety-related components, applicants referencing the BWRVIP-47 report for LR [license renewal] should identify and evaluate the projected CUF as a potential TLAA issue.	TLAA issues identified for lower plenum components have been evaluated for GGNS in LRA Section 4.3.1.3.
BWRVIP-74-A, BWR Reactor Pressure Vessel Inspection and Flaw Evaluation Guidelines	
BWRVIP-74-A (4) The staff is concerned that leakage around the reactor vessel seal rings could accumulate in the VFLD lines, cause an increase in the concentration of contaminants and cause cracking in the VFLD line. The BWRVIP-74 report does not identify this component as within the scope of the report. However, since the VFLD line is attached to the RPV and provides a pressure boundary function, LR applicants should identify an AMP for the VFLD line.	The vessel flange leak detection (VFLD) line is within the scope of license renewal and subject to aging management review. Loss of material and cracking are identified as aging effects requiring management. Aging of the vessel flange leak detection line is managed by the Water Chemistry Control – BWR Program as verified by the One-Time Inspection Program.

Action Item Description	Response
BWRVIP-74-A (5) LR applicants shall describe how each plant-specific aging management program addresses the following elements: (1) scope of program, (2) preventive actions, (3) parameters monitored and inspected, (4) detection of aging effects, (5) monitoring and trending, (6) acceptance criteria, (7) corrective actions, (8) confirmation process, (9) administrative controls, and (10) operating experience.	Descriptions of plant-specific aging management programs in Appendix B address the required ten elements.
BWRVIP-74-A (6) The staff believes inspection by itself is not sufficient to manage cracking. Cracking can be managed by a program that includes inspection and water chemistry. BWRVIP-29 describes a water chemistry program that contains monitoring and control guidelines for BWR water that is acceptable to the staff. BWRVIP-29 is not discussed in the BWRVIP-74 report. Therefore, in addition to the previously discussed BWRVIP reports, LR applicants shall contain water chemistry programs based on monitoring and control guidelines for reactor water chemistry that are contained in BWRVIP-29.	The Water Chemistry Control – BWR Program monitors and controls reactor water chemistry in accordance with the guidelines of BWRVIP-190, which supercedes BWRVIP-29.
BWRVIP-74-A (7) LR applicants shall identify their vessel surveillance program, which is either an ISP or plant-specific-invessel surveillance program, applicable to the LR term.	GGNS has received NRC approval to use the BWRVIP ISP. This has been applied to the Reactor Vessel Surveillance Program.
BWRVIP-74-A (8) LR applicants should verify that the number of cycles assumed in the original fatigue design is conservative to assure that the estimated fatigue usage for 60 years of plant operation is not underestimated. The use of alternative actions for cases where the estimated fatigue usage is projected to exceed 1.0 will require case-by-case staff review and approval. Further, a LR applicant must address environmental fatigue for the components listed in the BWRVIP-74 report for the LR period.	Fatigue for the period of extended operation (including discussion of thermal cycles, projected cumulative usage factors, environmental fatigue, etc.) is evaluated as a TLAA in LRA Section 4.3.

Action Item Description	Response
BWRVIP-74-A (9) Appendix A to the BWRVIP-74 report indicates that a set of P-T curves should be developed for the heat-up and cool-down operating conditions in the plant at a given EFPY in the LR period.	Development of pressure-temperature limits for the period of extended operation has been evaluated as a TLAA in LRA Section 4.2.2. Pressure-temperature limit curves will continue to be updated, as required by Appendix G of 10 CFR Part 50.
BWRVIP-74-A (10) To demonstrate that the beltline materials meet the Charpy USE criteria specified in Appendix B of the report, the applicant shall demonstrate that the percent reduction in Charpy USE for their beltline materials are less than those specified for the limiting BWR/3-6 plates and the non-Linde 80 submerged arc welds and that the percent reduction in Charpy USE for their surveillance weld and plate are less than or equal to the values projected using the methodology in RG 1.99, Revision 2.	Percent reduction in Charpy upper shelf energy (USE) for beltline materials, plates, and welds for the period of extended operation is evaluated in LRA Section 4.2.3. The reductions have been shown to remain less than the limiting reductions discussed in BWRVIP-74-A.
BWRVIP-74-A (11) To obtain relief from the in-service inspection of the circumferential welds during the LR period, the BWRVIP report indicates each licensee will have to demonstrate that (1) at the end of the renewal period, the circumferential welds will satisfy the limiting conditional failure frequency for circumferential welds in the Appendix E for the staff's July 28, 1998, FSER, and (2) that they have implemented operator training and established procedures that limit the frequency of cold overpressure events to the amount specified in the staff's FSER.	GGNS has received relief from the in-service inspection of the circumferential welds for the remaining term of the original operating license. If future relief is desired, a request for extension of this relief for the extended operating period will be submitted to the NRC in accordance with 10 CFR 50.55(a) prior to the period of extended operation. This discussion is included in LRA Section 4.2.4.
BWRVIP-74-A (12) As indicated in the staff's March 7, 2000, letter to Carl Terry, an LR applicant shall monitor axial beltline weld embrittlement. One acceptable method is to determine that the mean RT_{NDT} of the limiting axial beltline weld at the end of the period of extended operation is less than the values specified in Table 1 of this FSER.	The limiting axial beltline weld has been evaluated using the fluence at the end of the period of extended operation and the limiting material properties (chemistry and initial RT_{NDT}) of the applicable adjoining materials. This analysis has been projected through the period of extended operation per 10 CFR 54.21 (c)(1)(ii). This is evaluated as a TLAA in LRA Section 4.2.5.

Action Item Description	Response
BWRVIP-74-A (13) The Charpy USE, P-T limit, circumferential weld and axial weld RPV integrity evaluations are all dependent upon the neutron fluence. The applicant may perform neutron fluence calculations using staff-approved methodology or may submit the methodology for staff review. If the applicant performs the neutron fluence calculation using a methodology previously approved by the staff, the applicant should identify the NRC letter that approved the methodology.	The method used for the neutron flux calculation adheres to the guidance prescribed in Regulatory Guide (RG) 1.190. This is discussed in LRA Section 4.2.1.
BWRVIP-74-A (14) Components that have indications that have been previously analytically evaluated in accordance with subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period shall be reevaluated for the 60-year service period corresponding to the LR term.	No ASME Section XI flawed components with evaluations in accordance with subsection IWB-3600 of Section XI to the ASME Code until the end of the 40-year service period were identified for GGNS. [This is discussed in LRA Table 4.1-2.]

Appendix D

Technical Specification Changes

10 CFR 54.22 requires that an application for license renewal include any technical specification changes or additions necessary to manage the effects of aging during the period of extended operation. A review of the information in this License Renewal Application and the Grand Gulf Nuclear Station Technical Specifications determined that no changes to the Technical Specifications are required.